THE ARCHIVES OF PHYSIOLOGICAL THERAPY

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Devoted to the Diagnostic and Therapeutic Uses of Electricity, Radiant Energy, Heat, Water, Mechanical Vibration, Dietary Regulation, Exercise, Psychic Suggestion, etc.

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SPECIAL PLATES

Titles of Original Articles and the Names of the Authors of Such appear in Small Capitals; Department Headings in Italics.

Special Plates Illustrating

Repair of Excised Radius from Periosteum, Ankylosis of Radius and Ulna, Congenital Dislocation of Hip

Radius was removed ten years ago for necrosis and skiagraph demonstrates repair from periosteum to have been perfect. Patient is a laborer and never has any trouble with this arm.

Exposure 10 seconds; anode 20 inches from plate; 30-inch coil; ordinary tube, light anode; Hydrochinon developer.

By Dr. Gordon G. Burdick, Chicago, Illinois.

An unusual case of fracture of elbow followed by ankylosis of radius and ulna. Elbow joint functionable and arm very useful. Taken 20 years after injury. Diagnosis always uncertain until skiagraph was taken.

Exposure 20 seconds; anode 20 inches from plate; 22-inch coil; light tube; Hydrochinon developer.

By Dr. Gordon G. Burdick, Chicago, Illinois.

Same as Plate XXXI from different view-point.

By Dr. Gordon G. Burdick, Chicago, Illinois.

F. B., 2½ years old: female. Congenital dislocation of the left hip, showing differentiation of the joints, bones, muscles, and bowel. Dislocation was reduced by Dr. Oscar H. Allis, and treated in abduction by means of a wooden frame.

Made with a 20-inch coil, one-half minute exposure, two amperes actuating primary at 110 volts. Glycin. Metol Hydrochinon developer.

By Dr. William S. Newcomet, Philadelphia, Pennsylvania.

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VOLUME II No. I JULY 1905 WHOLE NUMBER VI

MECHANICAL VIBRATION AND STIMULATION *

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THE art of massage and manual manipulation is as old as medicine itself. It is believed that the Susruta of the Hindoos is the oldest written treatise upon the subject, which was probably followed later by the Chinese book Cong-Fou of the Toa-See that was written hundreds of years before Christ. Homer informs us that rubbing and anointing were used for their invigorating effects. The ancient Greeks and Romans used massage as a luxury and to hasten convalescence. Hippocrates said: "Rubbing can bind a joint that is too loose and loosen a joint that is too rigid. Hard rubbing binds, soft rubbing loosens, much rubbing causes parts to waste, while moderate rubbing makes them grow."

These maxims were the earliest definite knowledge relative to the physiological effects of manual therapy and may well be remembered by those who use massage today. Hippocrates also first employed mechanical vibration, wrapping one end of a saw with cloth that was applied to the part to be treated, while sawing a piece of wood with the uncovered portion, thereby producing vibratory oscillations in the affected part. Galen advocated massage and said that the middle quality between hard and soft should be used. This is the keynote of modern mechanical vibration. Paracelsus used rollers of magnetized iron for the purpose of treating local affections, which was perhaps the first mechanical device for applying massage.

In the early part of the eighteenth century the Abbe St. Pierre invented the trémoussoir, which was a primitive form of the later mechanical oscillation devices of Zander. In the middle of the nineteenth century Zander constructed his mechanical motion apparatus by which he treated neuralgias and various

* *Read before the Syracuse, N. Y., Academy of Medicine, March 24, 1905.*

painful conditions, and still later Vigoreaux employed a tuning fork in connection with a resounding box for the treatment of contractures and locomotor ataxia. Mechanical devices imparting a percussion stroke were first employed by Meltzer and Liedbeck of Stockholm, and Boudet, Charcot, and Gilles de la Tourette of Paris, who were the first contributors to the literature upon vibromassage.

The first English monogram upon the subject of mechanical vibration was written by the late Dr. Maurice Pilgrim; this was soon followed by a manual by Dr. Barnum, which together with the recent volume by Dr. Arnold-Snow, the contribution by Monell, and the journal published in the interest of a vibrator instrument company, comprise the literature upon the subject.

Mechanical vibration, as applied in medicine, is a rapid succession of wave-like motions imparted to the surface of the body and transmitted by continuity of structure in the direction of the wave line, to the deeper textures of the organism. The physiological effect of this imposed vibration depends upon the speed of the mechanism producing it, the length and character of the stroke, and the degree of pressure applied to the vibratode, which may be light, moderate, or heavy. Three methods of application are generally recognized, which are known as vibration as produced by a long stroke and heavy pressure, that may be applied directly over an engorged or congested organ; or, if applied directly over a nerve or a segmental nerve center for a certain length of time will produce inhibition. Second, stimulation is produced by a medium stroke and light pressure. This is the form of application suitable to those cases in which increased nutrition and a larger blood supply to a given organ or part is desired. Third, vibratory-stimulation is a combination of the above two and will be found useful in cases of pronounced visceral inaction and atony.

An instrument capable of achieving the therapeutic results desired should be so constructed as to permit of localized applications, it should possess a mechanism by means of which the stroke may be readily adjusted from shortest to the long stroke necessary to produce inhibition, its motion should be absolutely steady and harmonious, and it should possess sufficient motive power to allow the heaviest pressure to be applied without even changing the speed of the instrument.

The physiological effects of mechanical vibration are mechanical, chemical, thermal, physical, metabolic, and reflex.

Mechanically, it induces the removal of extravasations, exudations, and transudations; it breaks up adhesions and stimulates the circulatory and lymphatic systems; it stimulates excretion and secretion, relaxes over-contracted parts, and contracts over-relaxed parts.

Chemically, it assists in the interchange of oxygen and CO^2 and is said to increase waste products.

Thermal, by increasing muscular and general metabolism it increases the production of animal heat. Mild vibratory stimulation increases heat elimination, while vibratory-stimulation, applied to the cervical sympathetics, will cause a decrease of temperature in fevers.

Physically it assists endosmosis.

It aids metabolism by inducing anabolic and catabolic changes affecting the part, as in the removal of stasis, and an increase in the nutrition of a poorly nourished muscle.

By far the most important field of usefulness of mechanical vibration is its power to modify the innervation, circulation, and nutrition of remote structures and organs, by means of stimulation or inhibition applied to circumscribed cutaneous areas over the region of the spinal column, that are connected by sensory nerve filaments from segmental reflex centers of the spinal cord, that

likewise control or at least, modify, the constant stream of stimuli coming to and from the distant regions under their jurisdiction. What we know of life is that it consists of but a response of protoplasm to stimuli. This response may be direct, as is manifested in the lower forms of organized matter, or, as we ascend the scale of life they become both direct and indirect, or reflex, until we reach a stage of development in the higher vertebrates where these reflex stimuli are not only directed by the central nerve center, the brain, but also by the partially independent, sympathetic ganglia and segmented centers of the spinal cord, each of which has a sensory neural connection with a circumscribed cutaneous area.

It has been perhaps justly said: "That the skin is a harp of a thousand strings, upon which one who is master of the necessary means may play in such a manner as to produce almost any desired physiological or therapeutic effect." The skin is the keyboard, and the nerves and nerve centers are the internal mechanism. An understanding of the relation of these cutaneous areas to the nerves and nerve centers, is as essential to the physician who desires to employ mechanical vibration as is a knowledge of harmony and technique to a musician. It is in fact, not only necessary to understand the relation of the nerve endings of the skin with the nerve centers of the brain and spinal cord, but also through them, the relation of the skin areas with the internal viscera supplied with nerves from the same associated center.

The nutrition of a part is dependent upon its blood supply, which likewise is largely dependent upon the innervation of the blood vessels supplying it. As is well known two sets of nerve fibers innervate the muscular coat of the arteries. A vaso-constrictor set that causes the vessel to decrease its caliber and a vasodilator set that causes an increase of its lumen. The chief vaso-motor center is in the medulla. Destruction of this center causes a fall of blood pressure over the whole body; stimulation of this center causes a rise of blood tension. Should the spinal cord be severed that portion that is no longer connected with the vasomotor center of the medulla, will exercise a vaso-constrictor influence over the blood vessels normally subject to its control. After the cerebro-spinal connection has been completely severed, the tone of the blood vessels will, after a short interval, be controlled by the sympathetic ganglia. From this it would seem that the true vaso-motor cells are the sympathetics that lie in the spinal ganglia. From these cells in the spinal ganglia, axis cylinder processes pass as grey fibers to the blood vessels. These ganglia cells are controlled by fibers from the chief vaso-motor center in the medulla, which end around the subsidiary cells in the spinal cord, the neuraxons of these latter terminating by filaments that surround the true vaso-motor cells in the sympathetic ganglia.

Since grey rami-communicantes pass from the spinal sympathetic ganglia to the spinal nerves and are distributed with them to the skin and blood vessels, we can influence the distribution of blood, generally and locally, by increasing or decreasing the number of sensory impulses originating in the skin and muscles that may reach the vaso-motor centers.

The life and nutrition of a part, then, depend upon the maintenance of a perfect balance and adjustment of direct and reflex stimuli and should perchance, this balance become broken by defect or excess of stimuli at one end of this neural chain, the other end, by the law of compensation must partake of the opposite quality. It is upon this fact that the system of mechanical vibration is based.

Hilton partially demonstrated the therapeutic application of this principle in the years 1860-62. He wrote: "The same trunks of nerves whose branches

supply the groups of muscles moving a joint, furnish also, a distribution of nerves to the skin over the insertion of the same muscle, and the interior of the joint receives its nerves from the same source."

Regarding his therapeutic deductions from this anatomical premise he said: "I should say in aid of other means, employ this cutaneous distribution of nerves as a road or means toward relieving pain and irritation in a joint. You thus quiet the muscle, prevent extreme friction, and reduce muscular pressure and spasm. Therapeutics may certainly reach the interior of the joint and its muscles through the medium of the nerves upon the surface of the skin, and so induce physiological rest to all parts connected in moving the joint."

In the rational employment of mechanical vibration we would go a step further and instead of attempting to reach the inflamed joint through its neural connection with the skin about the affected part, we would seek out the cutaneous area in nerve communication with the segmental spinal center governing the affected member, where a corresponding irritation and compensating ischæmia and muscular contraction would without doubt be found. As a practical example I will report the following case that came under my observation:

Mrs. B——, æt. 70, came to me November 4, 1904, suffering from excruciating pain and tenderness in the left shoulder joint of two months' duration. There was no apparent history of traumatism or rheumatic diathesis as she had heretofore been free from painful or inflammatory affections of the joints. She was unable to raise her arm and the least movement caused her great pain. There were points of extreme tenderness over the acromian process and spine of the scapula. As the nerve supply over the affected area was the circumflex and as the circumflex is made up largely of fibers from the sixth cervical, I directed my attention to the cutaneous area over the origin of the sixth cervical nerve. I found on the left side of the spinal column from the fifth to the seventh cervical vertebræ, an area of extreme sensitiveness together with a contraction of the muscles of this region. As she had already employed all manner of local applications my treatment consisted only in deep vibration over the affected spinal area of hyperæsthesia. I used the longest stroke that my vibrator would permit of, beginning with moderate pressure and increasing it gradually until considerable force was exerted. I applied the vibratode between the transverse processes of the fifth, sixth and seventh cervical vertebræ on the left side, the duration of the application to each point being 20 seconds. At the end of the first séance there was complete relaxation of the contracted muscles along the spine and the points of local hyperæsthesia over the acromian and spine of the scapula were appreciably lessened. Motion of the arm was also less painful. At the end of the sixth treatment she was entirely cured, having perfect use of the arm.

The following is another typical case, illustrating the value of mechanical vibration:

W. H.——, æt. 22 years, occupation dental student. Family history excellent except in the case of one maternal aunt who is suffering from neurasthenia. His previous health has been good. About a year ago he began to suffer from gastric discomfort and indigestion. He had been working very hard, studying until late at night, taking but little exercise and eating at irregular hours. He complained of pain in the epigastric region which he described as being gustatory in character and coming on at irregular intervals, sometimes before and sometimes after eating. At first the distress seemed to be relieved by eating, but later the pain seemed to be aggravated

a short time after the ingestion of food. He had been under the care of several physicians in Buffalo, who had prescribed various dietetic régimes that in no way seemed to relieve him of his suffering.

He came home, being unable to continue his studies, and I saw him November 25, 1904. He was somewhat emaciated, weighing 123 pounds, his normal weight being 135 pounds. His complexion was sallow. He was very nervous and irritable, suffering at the time from insomnia. The pain was located in the epigastric region extending to the back.

Physical examination revealed considerable tenderness over the epigastric region that was diffuse and in no way localized. The lower border of the stomach was found to be midway between the ensiform appendix and the umbilicus. The liver was slightly enlarged. Bowels constipated and tongue red and dry. Urine contained indican and oxalates. I prescribed for him with no apparent result. November 30th I examined the stomach contents, the only abnormal finding being a slight excess of H C L.

Having had several similar cases that were relieved by mechanical vibration, I made a careful examination of the spinal region. The alignment of the vertebræ seemed to be normal, but by moving the index and middle finger with some pressure along either side of the spinous processes a line of hyperemia was produced on either side of the fifth, sixth, and seventh dorsal vertebræ, which persisted after having faded in other localities. Deep pressure revealed some tenderness in this region, although not very marked. By employing a wire brush and a high tension induced current these points of spinal tenderness became very marked.

The treatment consisted in applying inhibition over the tender areas. I used the longest stroke and all the pressure that the patient could bear. He was having considerable pain at the beginning of the séance that disappeared immediately. He slept well that night and had no more pain until the next afternoon, when it was again relieved by another treatment. He had in all five treatments. He has since experienced no return of the pain, he rapidly regained his weight, and is now continuing his studies.

In this case, without doubt, there was at first an hyperemia of the gastric mucosa, the sensory nerves of which became unduly stimulated by the amount of blood present in the capillaries. These sensory nerves instead of registering their impressions in the sensorium of the brain, excited that segmental area of the spinal cord with which they are connected by the rami-communicantes. This area lies between the sixth and tenth dorsal spines. From these centers nerves pass to the deep muscles of the back. The abnormal stimuli received by these segmental centers from the gastric mucosa are likewise reflected to those nerves supplying the deep muscles over this region. These muscles are excited to undue contraction and their sensory nerves thereby made more sensitive. This muscular area becomes ischemic and poorly nourished, which still further excites the sensibility of these nerves that now begin themselves to reflect abnormal stimuli over the same segmental center, that likewise conveys them back to the visceral sympathetics, thus establishing a vicious circle. Deep inhibitory vibration with a long stroke, relaxed the muscles over this area, thus lessening the hyperæsthesia at this end of the loop, at the same time inhibiting the stream of abnormal stimuli to and from the gastric mucosa, thereby establishing a normal neural relationship.

While I have been able to relieve many similar cases by means of mechanical vibration, I feel that, while the indications for its use are clear and well

marked, it is far from being a panacea and will perhaps be productive of more harm than benefit from the fact that it will fall into the hands of those who will use it carelessly, without due regard to the normal anatomical and physiological relationships of the parts they desire to treat, a proper consideration of which is absolutely essential to its intelligent employment. Or, should the relationship of nerve centers be fairly well mastered, it is very easy to fall into a line of false deductive reasoning, thereby leading to failure, and perhaps injury to the patient.

As an example let us assume a case of nasal obstruction as the result of a deflected septum, turbinate hypertrophy, or a spur on the septum. Here the pressure due to the mechanical obstruction with its resultant hyperemia, upon sensory nerve filaments would convey a series of abnormal stimuli by means of its neural connection to the superior cervical ganglion, and from thence to the segmental spinal centers corresponding with the upper five cervical vertebræ. As a result of vascular dilatation at the nasal end of the neural loop, there would be a compensating ischemia of the deep cervical muscles with contraction and cutaneous hyperæsthesia of this region, together with a unilateral headache as the result of a direct nasal reflex. An osteopath, or a physician unaccustomed to nasal work or overzealous in the use of his vibrator would, without doubt, direct his attention to the spinal end of the loop; he would apply inhibition either by manual or mechanical means. This certainly would for a time, relieve the nasal hyperemia and might temporarily relieve the patient. As is self evident, however, the relief could not be permanent without first having removed the primary source of irritation. The same rule applies to a vast number of reflex neuroses. From this it may be inferred that mechanical vibration, like all therapeutic measures, demands for its successful application a sound pathology, accurate deductive reasoning and good common sense.

THE DIAGNOSIS OF THE SIZE, FORM, POSITION, AND MOTILITY OF THE STOMACH AND BOWEL BY MEANS OF THE X-RAY*

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Formerly Assistant Chief Resident Physician in the Philadelphia Hospital, Director of the X-Ray Laboratory and Assistant Physician to the Medico-Chirurgical Hospital, Demonstrator of Physical Diagnosis and Lecturer upon Symptomatology in the Medico-Chirurgical College.

IN 1903, Cannon (1) made some interesting observations upon the "Mechanics of Digestion" by means of the X-ray. In his observations he used pellets of bismuth mixed with food, and watched their movements through the stomach and intestines of cats, dogs, rats, and guinea pigs, and even in man.

He determined that the stomach divided itself about midway into two portions, the cardiac and pyloric, and that

**Read before the College of Physicians of Philadelphia, Pennsylvania, May 3, 1905.*

Figure 1

Recumbent posture; plate posterior; tube 18 inches distant; exposure 15 seconds.

(1) A cent on the umbilicus. (2) The stomach. (3) The right sacro-iliac synchondrosis. (4) The cecum. (5) Descending colon. (6) and (7) Heads of femora.

Figure 2

Erect posture; plate posterior, made immediately after taking the food.

(1) A cent on the umbilicus indicating the position of the tube. (2) The stomach in the pelvis. (3) Sacro-iliac synchondrosis. (4) Cecum, empty. (5) Descending colon, empty. (6) and (7) Heads of the femora.

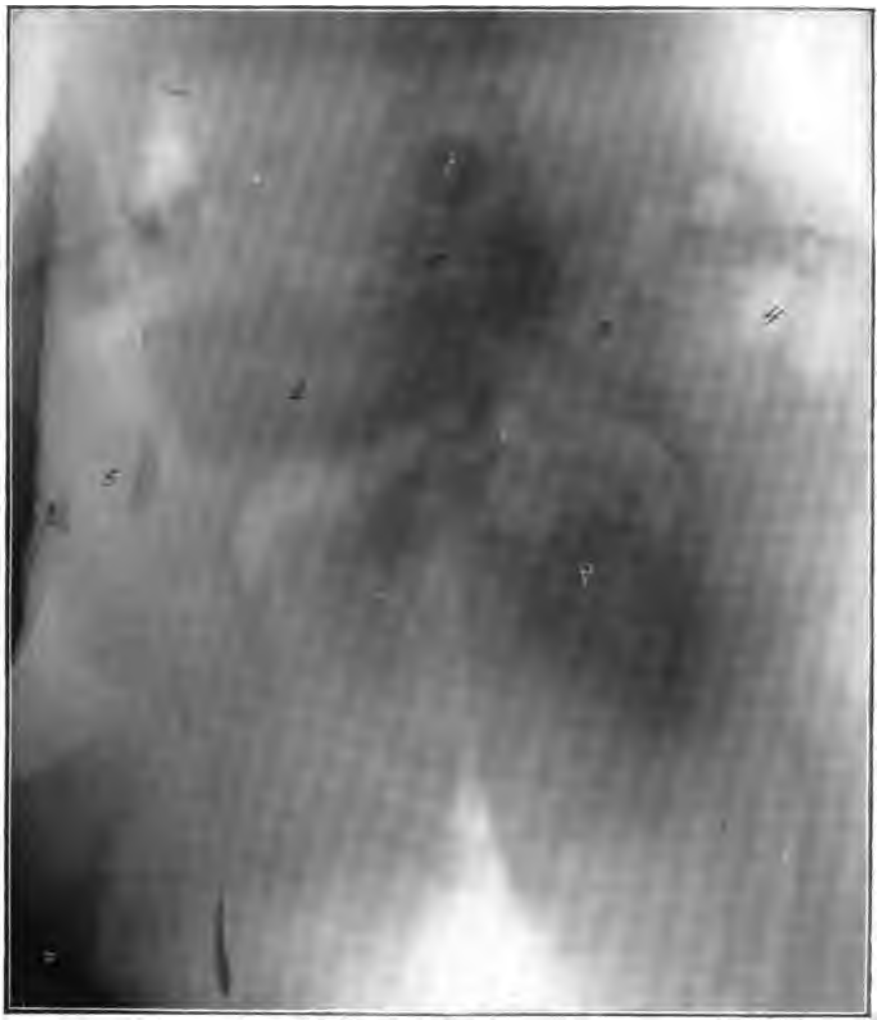


Figure 3

Erect posture, six hours after taking the food, half of the food still in the stomach.

(1) Cent on the umbilicus. (2) Stomach. (3) Sacro-iliac synchondrosis. (4) Cecum, empty. (5) Descending colon, empty. (6) and (7) Heads of femora. (8) Transverse colon, empty. (9) Shadows of food in the small intestines.

Figure 4

Position, etc., as in Figure 2.

(1) Umbilicus. (2) Transverse colon. (3) Right sacro-iliac synchondrosis. (4) Cecum and ascending colon, showing the food after 24 hours. (5) Isolated masses of the food in the small intestines. (6) Descending colon, empty. (7) and (8) Heads of femora. Technique same as with foregoing.

the peristaltic waves were to be seen entirely in the pyloric half, the cardiac half serving as a reservoir. He also determined that the carbohydrates pass more rapidly from the stomach than the proteid food.

In the ascending and transverse colon, he found antiperistaltic waves which moved backward toward the cecum. The peristaltic waves in the stomach occurred at the rate of 6 to 7 a minute, while in the colon they occurred every 15 to 20 minutes.

Tousey (2) used the X-ray to excite fluorescent substances such as fluorescine, or quinine bisulphate, and by this means outlined the stomach.

Prof. H. Rieder of Munich (3) seems to have been the first to make practical use of the X-ray in the clinical diagnosis of conditions of the stomach and bowel. He has recently published a valuable series of observations as to the position, size, form, and motility of the stomach and bowel, as studied by the X-ray, in the living subject.

To accomplish this he used about an ounce of bismuth subnitrate mixed with as much milk or other food as the patient could conveniently take. He then made a series of skiagraphs, the first being made immediately after taking the food, and the others at definite intervals to determine the rate at which the food passed through the stomach and bowel.

The examinations were made with the patient in the standing or sitting posture, the tube 60 cm. from the plate and the anode opposite the umbilicus. The exposures were made in a few seconds.

The position of these organs has often been determined by anatomical investigations, but such investigations in the living subject were difficult or impossible before the advent of the X-ray.

Briefly he determined the following points:

1. That the size, form, position, and motility of the stomach were in great part influenced by its being empty, partly filled, or overfilled, also by the contractions of the stomach.

2. When the stomach is filled it extends entirely to the left of the median line, except possibly the pylorus, which may extend to the right.

3. The position of the stomach is vertical, or at least diagonal instead of horizontal as is usually stated in text-books.

4. Bismuth nutriment is seen to begin passing the pylorus soon after it is ingested.

5. The size is influenced by the age, contents of the stomach, individuality, and pathological lesions.

6. The stomach is longer and more vertical in women than in men.

7. When bismuth enemata are given no difference in position of the colon is shown from that shown when the bismuth is given by mouth.

8. Fluids pass more quickly from the stomach than solid foods. 500 cc. of water leaves the stomach in from one-half to three quarters of an hour. Beer leaves more slowly. The motility was found to be the same for proteids and carbohydrates, but fats left the stomach more slowly. The presence of bismuth has no influence upon the rate at which the food leaves the stomach.

9. Normally bismuth food leaves the stomach in from 3 to 6 hours. In 12 hours part of it is found in the cecum, and in from 48 to 60 hours it has passed from the rectum. The bismuth causes obstipation in the large bowel.

10. The method can be applied to all patients who can take food. When food cannot be taken by mouth, the method can be applied to determine the size and position of the colon by giving enemata.

The case forming the basis of my report was Mrs. J. D., age 38, married. She has had three children. One year ago she had influenza, followed by a cough which has practically disap-

peared. Her present symptoms came on gradually and consist of anorexia, nausea, loss of weight, constipation, loss of sleep, and marked general prostration.

Physical examination showed some signs of tuberculosis at both apices, and especially at the right, but the disease seemed to be in a quiescent stage.

The abdomen is somewhat emaciated and the lower portion slightly pendulous.

The case seemed to be a favorable one upon which to test the value of the X-ray in the diagnosis of the size, form, position, and motility of the stomach and bowel. In order to eliminate confusing shadows, I ordered a purge at 8 P. M., which cleared the bowel of fecal matter. The patient was given milk for breakfast. At noon I gave her 20 ounces of milk mixed with an ounce of bismuth-subnitrate. I requested her to drink all that she could without making her too uncomfortable. In this way we obtain a fair idea of the size of the stomach.

Immediately after taking the food, I made a skiagraph (Fig. I) with the patient lying upon her back. Rieder seems to have made all of his skiagraphs with the patient in the sitting or standing position. By omitting the skiagraph in the supine position we lose a valuable point of information, namely the mobility of the stomach, as is clearly shown in this case. In the supine position the stomach is seen to be cylindrical in form, and almost vertical in position, with the pylorus on a level with the brim of the pelvis or about two and one-half inches below the umbilicus, and the pylorus seems to be curved upward.

A second skiagraph (Fig. II) was then taken with the patient in the standing position. This negative shows the shape of the stomach to be that which is usually described in text-books, and it seems to be normal in size, but the entire stomach is resting at the brim of the pelvis. Normally by this method the central portion of the pyloric end of the stomach is found to rest on a level with the umbilicus. We have therefore determined that the stomach is distinctly movable, and that it is displaced downward.

Rieder determined that food passes normally from the stomach in from 3 to 6 hours. Therefore after 6 hours, I made a third skiagraph (Fig. III) which showed about half of the food still remaining in the stomach. This proves that there is an abnormal delay in the passage of food from the stomach of this patient, and since there is no dilatation, we have a right to conclude that the delay is not due to obstruction, but to a lack of motility.

A fourth negative (Fig. IV) was made after 12 hours, which shows the stomach to be empty, and about half of the nutriment is in the cecum. The remainder is irregularly scattered through the pelvis and is evidently in the small intestines. Therefore the food moves at the normal rate through the small intestines. This negative also shows the transverse and the descending colon. The transverse colon is displaced downward and is on a level with the brim of the pelvis.

A fifth negative (Fig. V) made after 48 hours shows the large bowel to be practically empty, except in the region of the rectum, where a few shadows can be seen. The folds of the large bowel in the region of the cecum are clearly shown, which is probably due to the deposit on the walls of the bowel. Therefore there has been no delay in the passage of the food through the large bowel, and the only point of delay throughout the entire gastro-intestinal tract has been in the stomach.

In short we are dealing with a case of marked gastroptosis and lack of gastric motility, and also with a freely movable stomach.

Many men have tried heretofore to

Figure 5

Position, etc., as in Figure 2.

(1) Umbilicus. (2) Cecum and ascending colon, empty. (3) Transverse colon. (4) Descending colon, empty. (5) Remains of the food in the rectum, after 48 hours. (6) Right sacro-iliac synchondrosis. Technique same as with foregoing.

demonstrate these conditions. I among the rest have made several attempts, with little or no success. We failed for at least two reasons. In the first place we used too small a quantity of bismuth. I tried to accomplish results by using from 20 to 30 grains, which now seems ridiculous. In the second place in order to obtain good results the negative must be made in a few seconds or while the patient holds his breath. The negatives in this case were made in 15 seconds each. This is necessary to obtain clear and definite shadows. Heretofore our technique and instruments did not enable us to make such short exposures of the abdomen.

This method offers distinct advantages over the older methods. It is more accurate. It makes a permanent record. It is without danger. It causes no pain or inconvenience to the patient, except the inconvenience of coming for examination at stated intervals. It can be applied therefore to any patient who can take food. It determines the motility and mobility of the stomach, and the position of the transverse colon, which are points not determined by other methods.

It also has disadvantages. It is expensive. It requires from 15 to 18 hours of hard work. It is difficult or almost impossible in stout subjects. This last objection is not a serious one because we usually have emaciation in the patient in whose case this examination is indicated. The older methods of passing sounds or inflating the stomach with gas are not without danger, especially in gastric ulcer or cancer.

On the whole I believe the advantages far outweigh the disadvantages, and that it is a valuable additional method of examination.

REFERENCES

(1) Cannoa. "Observations on the Mechanics of Digestion." Journal of the American Medical Association, March 21, 1903.

(2) Tousey. "The relation of the X-Ray and Radioactive Solutions to the Examination of the Stomach." *New York Medical Journal,* May 21, 1904.

(3) Rieder. "Contribution to the Topography of the Gastro-Intestinal Canal in the Living Man, together with Investigations Concerning the Duration of the Process of Digestion." Fortschritte auf dem Gebeite der Roentgenstrahlen, Feb. 14, 1905.

PHYSICOTHERAPY OF NEURASTHENIA*

BY J. A. RIVIERE, M.D., OF PARIS, FRANCE.

NEURASTHENIA, as was justly perceived by Beard, is a want of nervous energy, "Nervous depression," a fatigue accompanied by loss of nervous power, "Nervous exhaustion." It is no doubt weakness which predominates in the syndrome of Beard, but irritable weakness, "Irritable debility," requiring successively cerebro-spinal stimulants and sedatives of the nerve-cell, precisely dosed, so as to raise the forces and increase the nerve-tension. It is important to avoid abuse of nerve-stimulants, every artifi-

*Read at the joint session of the American Electro-Therapeutic Association and the Electro-Therapeutical Section of the International Electrical Congress at St. Louis, Mo., September 15, 1904.

cial excitement being speedily followed by correlative exhaustion.

If physicotherapy renders signal service in the cure of neurasthenic cases, it is precisely because it applies itself to the probable cause of the evil, to the *nutritive trouble of the nerve-elements.* By re-establishing the normal influx of the neurones, the nerve-dynamism, we restore the inhibitive function of the brain over the spine, we minimize the reflex power of the latter, and the disordered exaggeration of its automatism, "moderating action over the whole of the weakened and over-excited nervous system," such is the therapeutic formula which strictly applies to Beard's disease. The whole of physicotherapy should then be put in contribution; we must remedy the weakness of the vasomotor center, the lowering and above all the variability of the vascular tension, the diminution of the nutritive activity of the cells, characterized by the dyspeptic troubles, the phosphaturia, the digestive leucocytosis, the muscular atony, the visceral ptosis, the hepatic congestion and insufficiency, etc., etc.

Patients suffering from Beard's disease are the most refractory to pharmaceutical treatment. They are the most frequent victims of that medicinal poisoning so well described by Hayem and constantly deplored by enlightened physicians. We owe especially to Weir Mitchell and to Professor Raymond a better comprehension of the true treatment of neurasthenia, which is based at present on rigorous applications of physical agents.

Let us review briefly the most useful applications and begin with hydrotherapy. The douche of short duration with broken jet, on the spine and trunk, followed by the foot-douche and dry rubbing, is one of the best tonics for increasing the rate of forces in the case of people who are "fagged out," who have "no backbone," who need a mild reaction, capable of restoring their nerve-energy and will, of dispelling their anguish, scruples, and insomnia, of stimulating the peripheral circulation, and of generally increasing the lowered arterial tension. In case of marked arthritism, not an uncommon thing with neurasthenic patients, we should be satisfied to employ the Scotch douche applied by means of the rose; in this way there will be no risk of increasing the painful irritability.

Carbonic acid gas baths have remarkable advantages as tonic sedatives, especially if they are not taken too hot (34° centigrade on the average), nor of too long duration (20 minutes at the most). A few baths of CO_2 literally transform some people who are depressed, devoid of physical and mental vigor; we see before our eyes, so to speak, the continuous renewal of their nervous and intellectual energy, the restoration of appetite and sleep, the remarkable improvement of the gastro-intestinal atony and of the muscular weakness, often so persistent. This action, powerful and sustained, of the CO_2 bath, makes it one of the most active and thorough agents of nerve-cure. Arthritic subjects are those who benefit mostly from this mode of treatment.

The CO_2 bath remedies, in fact, the gastro-hepatic auto-intoxication, which is the principal cause of this strange sensation of morbid fatigue, the origin of the greatest nervous discomfort and especially of the great cephalic irritability. Thanks to the *titillating* and galvanic influence of the gas on the innumerable nerve-tufts of our external envelope, we obtain a derivative effect on the cerebro-medullary centers, an increase of gastro-intestinal peristaltism, a complete unlocking of the portal circulation; in short, a sort of *re-education of the vaso-motor centers.* By acting on the peripheral capillary circulation the CO_2 bath modifies also the mechanical distribution of the blood, re-establishes the muscular force, increases the general metabolism and the proliferation of the hæmatob-

lasts, favors oxydations and the elimination of toxins. This really amounts to an anti-arthritic influence.

Mechanotherapy and massotherapy apply principally to the gastric-dilatation, to the constipation and to the oliguria of neurasthenic subjects. Methodical massage acts as does the *re-educating* exercise, compensatory mechanotherapy, rational gymnastics, by combating the muscular atrophy and rendering the joints supple in arthritic subjects as well as regulating their nerve-influx and their general reflex mobility. Amyosthenia (which sometimes extends to the unstriped muscle fibre) isthe chief cause of the gastric dilatation of nervous dyspepsia and of general hypotension; the apparatus for mechanotherapy and massotherapy, when properly combined, remedy this diminution of muscular function as well as the circulatory and glandular sluggishness.

The digestive troubles, so important in neurasthenia, that for some authors they attain the dignity of being the *pathogenic* element in the disease, the alternatives of fatigue and excitement with great loss of strength, the morning depression (due to insufficient storage of energy and the loss thereof during sleep); all these symptoms call for a treatment by massotherapy, by vibrotherapy, by kinesitherapy, all excellent methods for the restoration *ad integrum* of the molecular nutrition. Abdominal hydromassotherapy acting on the abdominal nerve-plexuses acts like a powerful moderator of the hypochondriac reflexes coming from the solar plexus, that "abdominal brain," as Fichat named it. Melancholia, "the blues," loss of interest in life, are symptoms referred from antiquity to pathological modifications of the great vegetative system, and the modern study of neurasthenic conditions has only confirmed these results of the experience of our ancestors.

The method of vibration and massage is also very valuable to remedy spasmodic phenomena, of secondary importance, no doubt, but very disagreeable to patients. Such are cramps, twitchings, fibrillary contractions, dysphagia, trembling, dyspnœa. Giddiness and tachycardia are more within the pale of hydrotherapeutic agents. The last mentioned symptom is particularly attenuated by cold applications to the precordial region, by Chapman's bag, etc. Hyperesthesia, parathesia, and diverse algies often so capricious, dysesthesia (numbness, tingling) yield to well-devised massotherapy. We thus increase the circulation of the blood and lymph, we improve the nutritive condition of the skin and muscles, we stimulate the osmotic phenomena of the nerve-cell. It is thus an excellent treatment for local neurasthenias, such as Professor Huchard has defined, and a most active remedy for the reduced vitality of the neurones in cerebro-spinal debility.

However, it is certainly electrotherapy which renders the greatest services in the treatment of neurasthenia, and those that are the most speedily appreciated. It holds, and will long hold, the first place for modifying nerve-nutrition and harmonizing nerve-reactions. Even as a measure of prevention electricity can be used to save certain nervous subjects (or patients of neurotic heredity) from falling into neurasthenic exhaustion. There exists, in fact, a prodromal period of neurasthenia, as there is a premonitory period of consumption. It is, therefore, the business of the sagacious practitioner to make an early diagnosis and thereby enhance the chances of a probable cure.

All the modes of electrotherapeutics, faradisation, voltaisation, franklinisation, and even magnetism have been utilized from the time of Beard until now. But the use of alternating high-frequency currents, auto-conduction, the sofa-condensator, the resonator, etc., are remarkably favorable in arthritic cases, in which these agents improve the oxyda-

tions, whilst they raise the arterial tension. It is well, however, to make short applications and to favor frequent elimination during the course of treatment, by means of abundant diaphoresis, thermoluminous baths (on which we shall soon speak), diuretic drinks, sometimes a little calomel mixed with bicarbonate of soda. It is well also to watch the treatment in case of marked arteriosclerosis and to cease the strong currents as soon as the radial marks a pressure above 18° of mercury. It would, moreover, be an absurdity to make these applications without due attention to medical dosage. Gastric upset, lassitude, headache, giddiness, fever, insomnia, excitements, etc., may show themselves in certain cases as symptoms of strain and auto-intoxication to which arthritic subjects are exposed in consequence of the uric acid and other discharges provoked easily enough by exaggerations and ill-directed d'Arsonvalisation. It is necessary, then, to have constant medical supervision.

The electrostatic bath with the electric douche or cephalic "souffle" is much used against cerebral depression, insomnia, paresia of the limbs, headache, "en casque." Frictions and the negative "souffle" may be used for regions affected with neuralgias or simple hyperesthesia. The static bath has a double effect: it is a sedative and it regulates the nervous system; when well handled it will conquer the most persistent pains, those of the sacral, and similar regions of pain. It increases also (though in less degree than the high-frequency currents) the nutritive exchanges, retarded or perverted by arthritic influence, whilst it obtains from the nerve substance a better balanced incitability. The neuralgias and nerve-spasms which resist the static bath generally yield to the faradic current.

Electrotherapy should also be preferred to hydrotherapy in cases when the reactions are slow to manifest themselves, when rheumatic irritation is prompt, and the respiratory organs sensitive, also the numerous cases of neurasthenia with diminished circulation of the skin or subject to giddiness or cardiac spasm. It is perhaps for this reason that for the female sex electricity represents the treatment to be preferred.

Franklinisation should also always commence by short sittings, so as not to make too strong an impression on the patient by an electric energy which may upset the system and cause a certain uneasiness, thereby interfering with the continuity of the treatment. "Patience and moderation," such should be the invariable motto of the therapeutist in physicotherapy as well as in pharmacology. For the great general depression with pronounced myosthenia nothing is so valuable as the bipolar high-frequency effluviations. It is also the treatment to be preferred in sexual neurasthenia, when we wish to combat impotence and anaphrodesia in the male, or utero-ovarian atony with dysmenorrhœa in woman.

By the harmonization and the regulation of the central nervous system, a state of equilibrium is communicated, so to speak, to the whole of the living organism, complex as it is. By stirring up the nervous influx in the cells, by insuring their trophic integrity, by favoring the temporary functional hypertrophy of the neurones with more direct contiguity, methodic electrotherapy visibly restores the disturbed vitality of neurasthenic subjects. Science, it is true, has not yet explained by what chemical processes, by what vibrations of the molecular order, the energy of the neuroglia and the power of the cellular connections are *re-made* and regenerated, whilst the fatigue and nervous exhaustion are abolished. The analogies of the electric and nervous currents, which seem to obey the same laws (Helmholtz), explain why electric treatment, which brings back the good conducti-

bility and the proper orientation, precludes paresthesia, delay in the transmission of sensibility, fusion and accumulation of sensations, polyesthesia, synalgies, errors, and perversion of localized sensations abnormal sensations of hot and cold, tingling, pricking, numbness) which torture the minds of neurasthenic patients, whilst they portend to them graver objective disturbances and serious lesions. Headache and neuralgias as well as reflex pains of sympathetic derangement, central or local algies (peripheral or visceral) affect ing the stomach, the intestine, the heart, with irradiations, are eminently (and almost exclusively) the proper domain of electrotherapy.

Static baths and strong currents ward off acute or emotional attacks, diminish the intensity of localized surface pains, obliterate the stigmata of neurasthenia and that species of fixed sense-images, "analogous in the domain of sensibility to monomania in the intellectual domain" (Blocq). I could mention several cases of glossodynia, of obstinate rachialgie, of impotence, of ovarian or lumbo-abdominal neuralgia, cured in neurasthenic subjects in a few weeks, thanks to the gradual return of the fundamental nerve-equilibrium. In these cases of local algies it will be found useful, as the lamented Blocq advised, to *mobilize the pain,* which modification is in fact a palpable demonstration that the disorder is no grave lesion; a good means of obtaining this result is to faradize the painful surface with the electric brush, taking care to frequently repeat the applications, which should not last longer than ten minutes at most. I have also obtained good results from radium, from X-rays, from violet light, and even from localized heat.

In case of pronounced spinal irritation with sacrococcygeal pain or pain at the back of the neck, alternatious of hot and cold, stiffness, numbness, cephalic troubles, I am absolutely convinced that electricity, when well handled, can keep away the spectre of tabes or of general paralysis. The fixed idea of a grave condition, the state of anxiety, of physical obsession which readily characterize neurasthenic debility and which influence the mind to the extent of disorganizing all nervous synergy, disappear gradually, by the reactional compensation that electricity brings to the cerebro-spinal system. Normal vitality is awakened gradually, without violence by the physiological action of the *sole physiological tonic, by the recharging* of the living accumulator and condensator. The cerebral activity is no longer interfered with, the memory becomes more retentive, the judgment more confident, reason less timorous, the will more energetic and not so listless. The neuropath is a transformed being.

An excellent adjunct to electrical treatment is radiotherapy. The vibrations of the red rays are well borne and contribute to raise the strength and to regulate the sensibility. The thermo-luminous baths (as I amongst the first applied them in medicine) possess a radiotherapeutic activity analogous to that of the solar rays, that is to say, *vivifying and productive of well-being and repair.* The blue light is soothing, etc. The thermo-luminous method, anti-acid and eliminating, increases also the nervous potentiality of neuroarthritic subjects, relieves their circulation, invigorates their cells, favors nervous reserve and cerebro-spinal tension, removes the spasmodic tendency, and puts in order the nutritive assimilation for the greater advantage of the renovation of the blood and tissues. We thus reach by means of the centripetal neurone the suffering cortical center. We throw off the nutritive waste, the parent of rheumatoid pains, of lassitude, of cryesthesia, of insomnia, and of abdominal congestion; for, in my opinion, auto-intoxication is the cause and lesion of nervous depression. This requisite elimination is

done especially by white light, which procures an excellent diaphoresis at a low degree of thermality, thanks to the improved radioluminous vibrations obtained by our diverse apparatus.

I might complete this exposition of the physicotherapeutic treatment of neurasthenia by describing certain accessories, such as hydro-electric baths, which I especially reserve for anemic and neuralgic patients and for patients showing some grains of sugar or some centigrams of albumin in the urine; continuous currents most useful in the treatment of muco-membranous colitis and of constipation, which so frequently follow in the train of Beard's disease; improved vibratory electric massage which I apply in the cure of different visceral algies; the cap and vibrating platform for cerebro-spinal neuralgia. Certain particular indications are met with by ozonotherapy, photherapy, and radiotherapy. We cannot apply any well defined or fixed or immutable treatment, any cure *ne varietur* to the mobile, ever-varying, manifold and subtle manifestations of neurasthenia. There must be a reasonable and wise coördination of the different physical agents, utilised in accordance with the hierarchy of the symptoms, the study of the reactions of cellular life, of personal differentiations, and (why not say the word?) the more or less conscious intuitions of the practitioner.

Summary and Conclusions.

1. The symptomatic and pathogenic complexity of the malady of Beard makes it necessary to have recourse to all the numerous resources of physicotherapy.

Success in treatment belongs to the physician who can utilise, according to circumstances, all the physical agents, and who has the greatest *command over his apparatus,* that is, who knows exactly what to expect of them.

2. As much as pharmacy is untrustworthy and dangerous, physicotherapy is adequate and profitable to neurasthenic conditions. The most powerful curative means are the cold or Scotch douche, the CO_2 bath, mecanotherapy and massotherapy, kinesitherapy and vibrotherapy, of which we have described the principal indications. As to electrotherapy, it assuredly occupies the first place for the cure of nervous exhaustion.

3. All the modes of electricity can be utilised; but those acting most energetically on the general condition are high frequency currents, electro-static baths, faradisation, radiotherapy, thermoluminous baths, hydro-electric baths, etc., etc. All these applications (which ought to be watched and dosed like medicines) should always remain within the exclusive province of the medical man.

4. I think that I have proved that no fixed form of treatment can be applied inflexibly to such a multiform and subtle disease as neurasthenia; by knowing how to reason, to coördinate, to vary, leave off, reapply, with judicious care, the physico-therapeutic agents domesticated by science, we shall realise the most difficult, the most complete, and the most lasting of cures.

EDITORIAL

THE RELATION OF PSYCHO-THERAPY TO PSYCHO-PATHOLOGY

Psycho-pathology has come to us via Psycho-therapy, which is not as it should be, and for which, indirectly, we may thank our own professional myopia. Directly, however, it is due to certain well-defined national tendencies of comparatively recent formation. The past twenty years has seen this nation a steady producer of those conditions most favorable for the propagation of psychoses and neuroses of all shades and complexions, which, however interesting, we may not here elaborate or describe.

As these prototypes of the newer life began to flood us, we conscientiously medicated them. They but returned, even they seemed to increase. Gradually it came to pass that their ultimate outcome appeared so utterly unreasonable and disconnected with any possible effort of ours, that actually or potentially they were dismissed as bores, as imaginary invalids. They insisted that we "did not understand," a claim not conscientiously to be denied in the light of later learning.

About this time, a New England woman of great shrewdness began to extend the ramifications of a disguised therapeutic propaganda most interesting to our "Malade imaginaire" victims. Protests as to the utter folly of her basic principles were unheard. "Cures," "Miracles," assailed our ears, while the order flourished as the green bay tree. It did not diminish the number of psychoses, rather the contrary; but it did hold its own within its own. Other productions similar to the Eddy arose, apparently indigenous to the varied parts of the country. New Thought, World Force, all kinds of Waves, all therapeutic, however ethical or pseudo-religious might be the coating.

The pervasion of these systems throughout the national body and mind within ever widening circles, had the curious effect of producing a renaissance of that earlier epidemic of mystery which then had worn the garb of Mesmer. It was not a complete renaissance. Mesmerism had already been reborn as Hypnotism, when there appeared upon the skies a new name, Suggestion. Its time of birth was most unpropitious, for the limitations of the word were immediately overleaped as, again commercially, popularity was seen riding with it. The word became the explanatory symbol of all mysteries; it assumed the form of that easy chair of Kant's; but, above all else were the therapeutic implications. There arose by night Hypnotic in-

stitutions wherein Suggestion ruled and cured.

We came to protest less, for here, at least, was a therapeusis made up of elements, which, however dimly apprehended, were unconcealed by the pseudo-metaphysical coating of the previous blights. To the thoughtful it became evident that under the spangles of the mountebank and charletan some true therapeutic worth lay concealed. Intense prejudice for months and years held back the medical member from working in the open upon these problems. As this stigma subsided, a dilemma even more serious presented. A vast amount of data had gradually accrued, utterly divergent, with no uniformity of result, no continuity of structure, entirely unexplainable. Consciously or unconsciously we sought for this explanation, the "Why" of these strange and contradictory phenomena. The construction of this explanatory system has grown into that which we know as Psychopathology. Its germinal point was the wonder-working of the charlatan, even as the wizardry of the court astrologer founded the basis of inquiry into the realm of that which is now astronomy.

From this Psycho-pathology, fertilized by the therapeusis of the charlatan, has sprung our modern Psycho-therapy with all its ramifications. Genetically then, to rightly value the latter, one must comprehend the structure of the parent. Psychology is the chiefest structural element in its formation. To this Psychology, France, Germany, England, and America each have given a fairly constant individual tone.

The country of Charcot was the first to really study Hypnosis. There have followed Charcot a line of eminent doctors and psychologists whose work has infiltrated into all nations. Their studies have been upon the abnormal in psychology; the sub-conscious with them has grown into a definite position in the concept of mind; its laws have been formulated; its workings in the abnormal have been written so large, so well, that we no longer call them into question, for in the most divergent types of cases, subconscious formations have been found completely causative in their relation to the pathological phenomena. Hypnosis with them has assumed its rightful place as a method of arriving at the sub-conscious. Correspondingly the sub-conscious has become that region wherein we now search intelligently for disturbances, search with tests and devices of a high degree of perfection.

Germany has proceeded in a radically different manner. There Physiological Psychology under W. Wundt, the successor of Fechner, became that which it is now today. Physiological Psychology has concerned itself with the normal mind, its end purpose being a reduction of the psychological operations to their physiological concomitants. It has made definite much that before was *a priori*. Their studies have been vast, orderly, systematic.

The measurement of mental state worked out upon the normal, has been assimilated with characteristic detail by German Psychiatrie in the person of Kraepelin, Ziehen, Ebbinghaus and others, resulting, at least, in a most useful codification of Insanity.

England has been influenced by both France and Germany without, however, losing the bent for the analytic psychology of her great teachers. Along these channels she has proceeded in a manner and with a scope more broad than either France or Germany.

In America it is a trifle hard to lay hold upon the dominating note, for, having no tradition, our tendency has been eclectic, our method original. From a psychology that was scholastic, facultative, theological, there has proceeded a psychology represented by such a leader as Professor James, a doctor as well as a psychologist, an original thinker, but a man who has drawn his inductions from abnormal psychology as well as from the physiological basis so amply developed by Wundt. It is through Professor James' influence that the best work has been done upon abnormal psychology. It is the diversity of the foci producing this material in America which naturally leads one to undervaluation, at least quantitatively. On the sub-conscious, upon suggestion, upon the study of incipient and borderland psychoses we are producing much that is valuable. The contributions from genetic psychology to psycho-pathology, the medical member until recently has not seen. Speaking paradoxically, it has shown him insanity before it appears, *in reductio* as it were; it has revealed the potentiality of adolescence at the point where physiology steps into pathology; it has given to him a mental developmental chart of the child as father to the man, has marked where lie the danger zones, what is fatigue, where, and how emotion develops, what education is and is not.

It has had the further value of correlating biology as a demonstrable structural element in psychology. Heredity, environment, variation, racial regression, recapitulation of racial traits in the individual have come to throw light upon the resultant of psycho-pathology.

Sociology as a collective psychology, anthropology, criminology are further fields which deserve a separate and full treatment, at this moment impossible to give.

From such a psycho-pathology we have arrived at a psycho-therapy far removed from that hid beneath the tinsel of the charlatan. It is based upon a knowledge of consciousness in its widest sense, in all its stratifications, upon a knowledge of its laws and their working in the abnormal as in the normal; it has grounded for it methods of exactitude imparted by the correlation with physiology; it sees the developmental history of mind, the concept of

life in heredity, variation and environment; it knows man not merely as the individual, but as the social unit. As from psycho-pathology it has drawn its life, its laws, its principles, so the chief accrements to itself must be through psycho-pathology; all that which psycho-therapy accumulates, comes back to itself, formulated, adapted by psycho-pathology.

We have dwelt thus upon this point that our new department of Psycho-therapy might not be misunderstood, even as we trust that it has not been misconceived. That Psycho-therapy is barren which answers only to the "How," forgetting to meet the "Why," which must ever arise. Indeed it is a part of our task to dispel the mystery arising from the suppression of the "Why." What boots the technique, the appliances and manner of inducing hypnosis or hypnoid or dissociative states; if we know not what we are thereby doing?

There is but one way in which the medical man may pursue psycho-therapy with an eye intent on science and truth. He must fulfill in his own epoch, those steps over which Psycho-therapy has passed. Psychology, biology, sociology, these structural parts of psycho-pathology must form for him the working basis. Much of this may be but indirectly acquired, for the vastness of the area outlimits individual capacity. The foundation must be built by those trained and specialized; the results accrue to him to be used in turn for the construction of his therapeutic edifice.

This rich material is produced from many sources, scattered, more or less uncorrelated, often of but narrow distribution. We have believed, that here, a new organ and a new function might arise possibly, under careful adaptive conditions, to develop to that point of fitness and usefulness where permanence and value might be assured.

We shall not attempt to make an absolutely definitive review of current literature; rather will it be elective, selective of that which is formative, useful. That which is not adaptable, we shall in many cases adapt to the general scheme of psycho-pathology and psycho-therapy. This adaptation will fall along a general mean; it will be made fit for a certain determinate tendency to define not so much the normal, the physiological states of mind, but rather to distinguish in particular where the physiological slowly merges into the pathological; to show the development of the latter from the former with an analysis of the changes, with an illumination of the causative conditions, and finally, in its proper logical position, to bring forth the widest of psycho-therapeusis in all its ramifications.

Many gaps will be found, but if the general movement tends ever so little to integrate psycho-therapy, the department will slowly grow in fitness as a direct necessity of present developmental conditions.

JOURNAL OF ADVANCED THERAPEUTICS

New York, N. Y., May, 1905

1. Certain Theoretical and Practical Considerations on the Use of High-Frequency Currents — Morris W. Brinkmann.
2. Report of the Committee on Current Classification and Nomenclature — Samuel Sheldon, W. J. Jenks, and Charles L. Clark.
3. Consideration of Some Electrical Modalities, with Cases Bearing Thereon — John H. R. Bond.
4. A Contribution to the Knowledge of the Radio-Activity of the X-Ray Tube — Otto Juettner.

1. Brinkmann assumes that forty thousand double vibrations per second should be the dividing line between low-frequency and high-frequency currents because the auditory sense ceases to distinguish at this point. Whether or not common sensation can analyze frequencies beyond this degree is still a question for future investigation to decide. The article consists of a discussion of some of the physical properties of the high potential currents and their physiological action.

2. See the ARCHIVES for June, 1905.

3. Bond believes that electricity constitutes the most powerful remedial agent now known for dealing with conditions of circulatory stasis, congestion, hyperemia, and inflammation, and as there are few diseases or injuries which do not present one or more of these conditions in a greater or less degree electricity has a very wide range of therapeutical usefulness. He considers that the application of high potential currents through a glass vacuum electrode gives the best results in superficial conditions, but that when the disease process is deeply located, as in congestion of the liver, he prefers the wave-current. Sometimes the combination of these two modalities is advisable. Applications with the glass vacuum electrode exhibit distinct, local, chemical effects; the wave current is purely mechanical. The wave current is also more powerfully tonic in its influence than the glass vacuum tube. The following cases are reported:

Case I. — Neuritis of the auriculo-temporal branch of the inferior maxillary division of the fifth nerve, cured by thirteen daily applications of the brush discharge and the wave current from the glass vacuum tube placed in the ear.

Case II. — Lumbago from unaccustomed muscular exercise in cold weather; cured by five applications of indirect static sparks.

Case III. — Brachial neuritis in a woman aged 82. Greatly relieved by 13 applications of indirect static sparks.

Case IV. — Brachial neuritis in a man aged 37. Twelve applications inaugurated an improvement which resulted in complete cure three months after they were suspended, during which time no treatment of any kind was applied.

Case V. — Stiffness of the wrist with wasting of the arm and shoulder as a result of faulty union in a Colles' fracture. Treatment consisted of ten applications of the interrupted static current through the glass vacuum tube for 25 minutes at a sitting, and the static wave current to the wrist for five minutes at a sitting, spark gap from one-half to three-quarters of an inch. Improvement sufficient to enable the patient to follow his occupation of plasterer was the result.

Case VI. — Retroverted uterus, painful menstruation, backache, and hypogastric pains with constipation in a woman aged 29. Four applications of the negative pole of the continuous cur-

rent in the vagina to the uterus, 20 to 40 ma. improved the local conditions and nine applications of the interrupted static current by means of the vaginal glass vacuum electrode, followed by nine applications of the wave current localized over the hypo-gastrium, produced complete symptomatic cure and nearly normal mobility of the uterus.

Case VII. — Laceration and eversion of the cervix, internal hemorrhoids, debility and loss of flesh. Patient aged 37. This patient was greatly improved by applications of the interrupted static current to the cervix, the vagina, and the rectum through glass vacuum tubes and the wave current localized over the hypo-gastrium. Improvement in the uterine lesions was such that she became pregnant during the following six months, for the first time in 17 years.

Case VIII. — Chronic cystitis in a woman aged 35. Patient was greatly improved by five applications of the interrupted static current through a glass vacuum tube in the bladder and the wave current over the hypo-gastrium.

Case IX. — Hypertrophic rhinitis in a man, singer, aged 25, accompanied by bleeding when the nose was blown, and thick, muco-purulent discharge. Eight applications of the continuous current, positive pole to the neck, negative in the nostrils through a bifurcated electrode, from 7 to 10 ma. for 10 minutes, inaugurated improvement at once and two months after leaving off treatment patient was quite well. One application of the interrupted static current through a glass vacuum electrode five minutes in each nostril with a spark gap of half an inch was also made at the time of his last visit.

4. This article consists of descriptions of and speculations upon various varieties of radiant energy which are present as the result of exciting an X-ray tube.

ARCHIVES OF THE ROENTGEN RAY

London, England, May, 1905

1. Experimental Research Concerning Direct, Indirect, and Secondary Skiagraphic Rays — Lewis Gregory Cole.
2. Notes on X-Light — William Rollins.
3. Treatment by Light and Heat — W. Knowsley Sibley.
4. High-Frequency Currents; Some Infective Diseases Amenable to Treatment — Clarence A. Wright.

1. Cole contrasts the high vacuum method of skiagraphy with the low vacuum method. The principle objection to the low method, he has found to be the unavoidable movement of the diaphragm in respiration, thus producing motion of the kidney from ½ to 1½ inches. In early work in spite of this long exposure and consequent movement he was partial to the low vacuum tube on account of the great detail obtained, and it was here that he discovered that better work could be done with an old than a new tube, and that an old high or low vacuum tube gave off under certain conditions a ray not obtainable under any condition from a new tube, giving clear outline and great detail with short exposure. This he called the ray of selective absorption. This he has discarded for the more expressive terms Roentgen ray direct, indirect, and secondary.

He does not believe the Roentgen ray to be homogeneous, but that the discharge from an X-ray tube consists of two distinctive classes of rays, their qualities dependent upon conditions to be described, and their combined action on a photographic plate is so detrimental to success as to render their separation a matter of importance. He assumes that the rays proceed from the focal point of the anode, whence they radiate in direct lines to the walls of the tube, here to be separated into the two classes to be described, the extent of this sepa-

ration varying in different tubes under different conditions.

Roentgen recognized the occurrence of secondary radiation in substances outside the walls of the tube, but no effort has been made to demonstrate the occurrence of this process in the walls of the tube itself.

The writer is convinced that two classes of rays emanate from the walls of the tube. The lines of flight of the direct rays being a continuation of their original lines of projection and the indirect rays being at various angles therefrom. The indirect rays possess to a marked degree the power of setting up secondary radiation in any object with which they come in contact. The separation of the rays into these two classes is largely due to the molecular formation of the glass constituting the tube wall. That portion of the discharge which passes through the glass at the points of least resistance continues in direct lines while the balance is either deflected in its passage through the wall or sets up a secondary action which extends outward in all directions as indirect rays. In proof of this the quantity of direct rays increases and the indirect decreases with the rearrangement of the molecules of the wall of the tube during the molecular action caused by the passage of the rays.

Cole has used the Wehnelt interrupter with adjustable platinum exclusively and has tested many coils. His usual length of exposure for renal skiagraphs is five to ten seconds in a patient weighing 150 pounds, and no more than forty seconds in a subject weighing 200 pounds or more. This requires a coil that will throw a yellow flame over a distance of twelve inches, and tube, coil, and interrupter must be in harmony.

A study of tube life has shown the following interesting facts: The vacuum of a low tube may be raised by making and breaking the current repeatedly. A new tube should be allowed to rest a day or so after each excitement. After a tube has been used daily for months it will suddenly become very high, resist attempts at lowering and become suddenly low. If treated moderately it recovers and becomes a very useful tube. During a crisis the tube is very low if the face of the anode is turned to the side with the tube poles north and south, but if turned toward the earth it may back up a twelve-inch spark. A tube which has passed through the crisis he terms as a seasoned tube.

The purple color shown in a tube which has undergone heavy use is not due to the deposit of platinum, but rather to aluminum or else is due to the moelcular rearrangement of the glass. When this change becomes complete, as in a seasoned tube, a very large proportion of direct rays may be obtained, even as high as 75 per cent.

Dense skiagraphs lacking in contrast are due to indirect rays and not to lack of penetration. A very complete series of experiments are illustrated, showing skiagraphically the effect of the direct rays alone, the indirect rays alone, and the combined rays in producing images upon a photographic plate. By means of suitable diaphragms to permit the passage of direct rays alone, a lead plate so placed as to cut off all direct rays, and the employment of blocks of paraffine upon the plate so as to set up indirect rays, the effects of each were studied by the writer. He seems to have succeeded in proving that the results of the ordinary "compression blende" are not due to the fact that less tissue is interposed, but rather to the exclusion of the indirect rays. He advises where a new tube must be used, that it be enclosed in a lead-lined box having an aperture 2½ x 3 inches in the bottom, thus excluding most of the direct rays, but he believes that no mechanical device can entirely compensate the fault of a new tube, but

that satisfactory work is only possible with a seasoned tube having the tube, coil, and interrupter balanced. He concludes as follows:

(1) It is rare to find a new tube capable of giving a large proportion of the rays most suitable for skiagraphy, no matter whether excited by coil or static machine, with or without spark gaps, single or multiple; with or without the introduction of a capacity.

(2) This does not materially depend on the conditions of the vacuum.

(3) A properly constructed tube will, with careful management, gradually improve, giving a larger proportion of direct or optimum rays.

(4) Coincident with the improvement of the character of the rays, we find an increased maintenance of the vacuum.

(5) After further usage, we find it difficult or impossible to lower the vacuum by customary methods.

(6) It is at this point in the life of the tube that the crisis occurs.

(7) After this the tube, as previously stated, is in its best condition for skiagraphy, and barring accident, may maintain this condition for a lengthened period.

(8) Accompanying the use of the tube, we find a gradual darkening of the glass, believed by many to be due to a deposit of metal from the anode. It is more than possible, however, that the change in the color is due to a molecular change in the glass, with resulting ionization such as is known to occur in glass tubes containing radium. If this be so, there would manifestly be a diminution in the electro-static phenomena, which in some instances are so annoying.

2. Rollins reviews briefly the means employed for measuring the intensity of X-light. He denies that the measurement of the electrical energy employed in its production, as shown in volts and amperes in the primary or milliamperes in the secondary currents, are an indication of the true amount of homogeneous X-ray given off from various tubes. Neither is the chemical effect of the X-ray, as shown by its action on certain salts and solutions held before the tube, an accurate measurement. Since the tube emits complex radiation the use of the phosphorescent standard compared photometrically with a fluorescent screen is also inaccurate, since different screens vary in brightness under the same radiation, and two tubes giving equal illumination emit different amounts and kinds of radiation, the fluorescent screens also deteriorate and the phosphorescent standard varies in brightness.

Roentgen's penetration gauge is superior to any method in general use, but is usually effective only when used with a fluorescent screen. Electrometers and electroscopes are of use when employed with selective filters. In using vacuum tube radiations in medicine, the tube should be adjusted to give the greatest amount of suitable radiation and selective filters must be employed to strain out the undesirable radiations.

If a radiograph is taken, the tube should yield those radiations which are most absorbed by bone and least by surrounding soft tissues lest the soft tissues should be so strongly ionized as to break down. The use of X-light in treating many skin diseases he believes unwise, since it profoundly affects life processes, whereas other vacuum tube radiations penetrate less deeply and are therefore more suitable. The use of radioactive substances in skin disease is also unwise on account of the penetrating gamma rays, while the effects of the beta rays on the skin can be produced by radiation from a vacuum tube illustrated in a previous note or from the electron arc previously illustrated.

3. Sibley has recommended for ten years the treatment of various rheumatic and gouty conditions by the local appli-

cation of radiant heat. His early experiments were made with a copper cylinder heated beneath by gas, the heat being a non-luminous reflection from the metallic surface. The therapeutic effect of heat is considerably increased by the addition of light rays, the necessity of the human body for light being well recognized.

Excessive internal drugging is being replaced by local or external applications; especially is this true in the arthrites. The apparatus for administering light and heat must be simple and easy of adjustment. The part treated should be fully undressed, not covered with lint, and exposed to the light and heat rays from one-half to one hour. The object is to produce free perspiration and reaction. If perspiration is slow in starting the skin of the part should be moistened. Perspiration begins first in the part under treatment, then over the whole body, and the temperature rises from one-half to three degrees Fahrenheit. The pulse and respiration are stimulated but return to normal after the treatment. In most cases the pain is relieved at once, the parts becoming relaxed and supple. The body should be rubbed down with a dry towel, and the limb generally massaged, the patient wrapped in a blanket and allowed to cool down gradually before replacing the clothes. The cases in which this treatment is indicated are every form of joint mischief, synovitis, bursitis, malnutrition or wasting of a limb, neuritis, chronic skin diseases, etc.

4. Wright continues his discussion of high-frequency currents. He considers tubercular hydrarthrosis amenable to vibratory electrization. Tubercular pleurisy, especially the chronic tubercular form, is favorable for treatment. The abdominal form of miliary tuberculosis is not suited for vibratory treatment, but the chronic variety to which the name tabes mesenterica has been applied is favorably influenced by high frequency. Chronic serous synovitis is much more amenable to treatment by high frequency than chronic tubercular arthritis.

MEDICAL ELECTROLOGY AND RADIOLOGY

London, England, April, 1905

1. The X-Ray Treatment of Rodent Ulcer and Cancer — J. Hall-Edwards.
2. A Case of Spleno-Medullary Leucocythæmia; Treatment with the X-Rays W. Ironside Bruce.

1. Edwards finds "soft" tubes of increasing usefulness in therapeutics and prefers to use them in conjunction with a mechanical mercury break, whereby the vacuum does not rise so rapidly as when an electrolytic interrupter is employed; the latter causes tubes to become hard so fast that it is difficult to determine the full effects of the rays derived therefrom. The only way to overcome the latter disadvantage is to have the tube re-exhausted, as the devices whereby the vacuum is lowered through the giving off of vapor from chemicals in the tube, do not render possible the acquisition of the same ray quality as does re-exhaustion. This is explained by the fact that a certain number of cathode rays pass through the glass and carry with them ions which have been separated from the atoms contained in the tube, and no matter how many atoms are admitted to replace lost ions the contents of the tube will always afterward consist of a mixture of damaged and complete atoms, which condition can only be eliminated by re-exhaustion.

While the measurement of the amount of current passing through the tube is of importance it is not a reliable measurer of the radiance derived therefrom, because this radiance depends upon the

character of the atomic content of the tube which is constantly changing. The radiometer of Benoist and the chromo-radiometer of Holzknecht are regarded as distinct advances in this connection, although they fall far short of being ideal. The "personal equation" plays an important part in the results given by them.

Edwards believes religiously that no therapeutic result can be attained without the induction of some cutaneous "reaction," but this reaction need not necessarily in all cases be marked or severe. He characterizes the results of X-radiation in epithelioma as being frequently "little short of marvelous even if they fall short of bringing about a complete cure in any special case."

While there may not be demonstrable a pathological line of demarkation between rodent ulcer and epithelioma, yet Edwards holds that the first term should be restricted to those malignant processes which do not involve lymphatic glands, and the latter to those processes which do exhibit such tendency towards extension. He desires to make this point somewhat emphatic, as he has found that surgeons use the result of X-ray treatment as a differential diagnostic test (if the sore gets well it is rodent ulcer, if it does not it is epithelioma), and this is not fair or just to the X-ray, or satisfactory from a scientific standpoint. Surgical measures should be applied in conjunction with X-rays in many cases of epithelioma and carcinoma, and all cases of ulcerating malignant trouble should be rendered as nearly clean, surgically, as possible. He prefers masks of plaster of Paris and tin foil, or screens made of two pieces of cardboard between which are sheets of tin foil, as a protection to sound tissues.

A number of cases of superficial and deeply located malignant disease are reported and , although the results in the deeply located cases cannot compare for a moment with those attained in the superficial cases, yet they are sufficiently encouraging to call for further investigation. Superficial recurring malignant tumors of the breast will usually yield very satisfactorily to X-radiation.

2. Bruce's case occurred in a young married woman, aged 23, who was admitted to the Charing Cross Hospital on September 10, 1904. She was extremely anæmic, thin, and her abdomen was greatly increased in size, spleen extended nearly to the pubes and within half an inch of the median line at the level of the umbilicus. Was slightly tender to pressure and ill-defined in outline. Aortic and mitral regurgitation were present. Red blood cells 2,300,000 per cmm., white cells 1,400,000 (myeolocytes, 34.4 per cent., polymorphonuclears 52.2 per cent., eosinophiles 6 per cent., nucleated red cells 6 per cent). Poikilocytosis well marked. Hæmoglobin 34 per cent. Mouth temperature from 98° to 100° F.

Ten-minute exposures with a hard tube 9 inches away, over the splenic area only, were given every day for nine days, then intermitted for six days, and reapplied for the following five days.

On the nineteenth day from the time exposures were begun she was discharged from the hospital, her red blood corpuscles then being 3,200,000, white blood corpuscles 232,000, hæmoglobin 37 per cent. Poikilocytosis much decreased, myeolocytes greatly diminished, spleen an inch and a half smaller toward the pubes.

Since then she has been able to walk to the hospital for continuance of the exposures, which have been given every day on alternate weeks. Improvement has been continuous, and on February 21, 1905, red blood corpuscles were 4,750,000, white blood corpuscles 42,200 (myeolocytes 23 per cent., polymorphonuclears 63 per cent., ratio 1 to 113), hæmoglobin 43 per cent.

Spleen had continued to diminish in size, being then four fingers' width from

the pubes, and about one and one-half inches from the umbilicus, with more sharply defined borders. Patient looks and continues to feel much improved in every respect.

ARCHIVES D'ELECTRICITE MEDICALE

Bordeaux, France, April 25, 1905

1. The size of the Cardiac Area after Recovery from Tuberculosis — Dr. H. Guilleminot.
2. The Treatment of Neurasthenia with High Arterial Tension by High-Frequency Currents — Dr. Ugo Gay.
3. The Action of a Rapidly-Interrupted Galvanic Current upon the Development and Nutrition of Animals — Drs. H. Bordier and Bonnefant.
4. The Favorable Action of the X-Rays on Non-Suppurative Tubercular Adenopathies — Dr. J. Bergonie.
5. Localizer for the Therapeutic Application of the X-Ray — Dr. H. Nogier.
6. Thurston Holland's Compression Diaphragm.

1. This is a study, by means of the orthodiagraph, of the size of the heart in eleven male medical students in different stages of pulmonary tuberculosis. They were all between the ages of 23 and 30. Guilleminot found that in the early stages of tuberculosis or in pretuberculosis the cardiac area is smaller than normal. In cases of healed tuberculosis on the other hand the heart appears larger than normal. The measurement of the size of the heart in the early stages of tuberculosis may prove very important from a diagnostic point of view. And then again a favorable prognosis may be made when the heart is found larger than normal in a case of well-established tuberculosis. This, of course, is with the exception of the hypertrophy sometimes occurring in fibroid phthisis and also the cardiac dilatation of advanced consumption.

2. Hypertension does not always indicate organic disease of the heart or blood vessels, although if of long duration it will lead to these changes. Causes of functional hypertension are uric acid, lead poisoning, menstruation, and the menopause, interstitial nephritis, retention of the chlorides, over-activity of the suprarenal capsules.

A neurasthenic patient with high arterial tension should not be treated by the Weir Mitchell method, which is suited for the opposite condition of debility. The indication, on the contrary, is to rid the system of the toxic substances and reduce the arterial tension. High-frequency currents succeed wonderfully well in these cases; while in his hands the same application has failed to relieve the opposite condition of hypotension in neurasthenia or hysteria.

High-frequency currents (auto-conduction) increase cellular activity, the amplitude and frequency of respiration, and the amount of oxygen absorbed and carbonic acid exhaled. The amount of oxyhemoglobin increases and also its chemical activity. There is an increase in the amount of urine and in the phosphates, chlorides, sulphates, and uric acid excreted. There is an increase in the amount of urea and total nitrogenous matter, and the proportion of urea to total nitrogenous matter increased from 2 to 4 per cent. Twelve patients were treated. The apparatus consisted of a 40-inch (1 meter) induction coil with a Wehnelt interrupter on the 110 volts alternating current; a double plate Franklin condenser, and a large D'Arsonval solenoid. Primary current 6 amperes, secondary current 350 to 400 milliamperes. Treatments 25 minutes daily. In one case there was a change in 10 days from a pressure of 160 millimeters to 120 mm., the change in the urine being from 1,300 c. c. to 1,600 c. c.; and urea from 12 to 16 grammes per liter; and uric acid from 3 to 1½ grammes per liter. The subjective symptoms were all very much improved.

Case 2 was treated for 15 days, arterial tension falling from 180 to 130. Case 3 for 20 days, reduction from 185 to 155.

His conclusions from the whole twelve cases are that high-frequency currents in these cases produce a rapid elimination of toxic substances from the blood and a diminution of arterial tension with corresponding improvement in general symptoms; and that the treatment is prophylactic against arteriosclerosis.

3. The apparatus employed by Bordier and Bonnefant consisted of a rheostat to reduce the potential of the 120 volts direct current; electric motors causing the revolution of a copper cylinder, with insulating material inlaid in such a way that the electrical contact (with a carbon brush) is broken during one-third of each revolution.

In the case of young rabbits (about three weeks old) the current was applied every other day, interruptions at the rate of 3,720 a minute; negative electrode on the shaven nucha, positive on the shaven lumbar region. The animal is at first completely anæsthetized by a current of 18 or 20 m. a.; then a current of 8 m. a. is allowed to flow for 10 minutes; respiration was regular, but rapid, 110 to 130 per minute. At the end of the seance the animal presented no apparent motor or sensory disturbance. The first rabbit experimented upon died immediately afterward from strangulation, the electrode having been fastened on by an elastic band passing around its throat.

The second rabbit showed no bad effects except that on two occasions there was temporary paralysis of both hind legs. At the end of two months it had gained 115 grammes less in weight than had been gained by a control animal during the same length of time.

With adult rabbits the initial anæsthetizing current was 35 to 40 milliamperes and then 10 m. a. were given for 10 minutes. The interruptions were at the rate of 4,320 a minute. The rabbit was weighed before each application and its heat radiation was determined by D'Arsonval's calorimeter afterward. After fifteen daily applications the rabbit had lost one-tenth of its bodily weight and its heat radiation had changed from 1,500 hour calories to 3,000.

Thus in growing animals this form of electrization retards development and in adult animals it causes emaciation.

4. See Foreign Letter, this issue of the ARCHIVES.

5. Nogier describes a diaphragm which may form part of Beclere's tube stand; it has an iris diaphragm, and slides provided with cylinders of different lengths and diameters. If the patient is lying down these cylinders may be made to produce compression by placing a weight (two heavy books) on top of the tube carrier. The localizer is equally good for therapy and diagnosis and can be placed in any position.

ARCHIVES D'ELECTRICITE MEDICALE

Bordeaux, France, May 10, 1905

1. The Action of the X-Ray upon the Platino-Cyanides, especially that of Barium — H. Bordier and J. Galimard.
2. Electrodiagnosis with Condenser Discharges — Ludwig Mann.
3. Influence of Electric Excitation upon the Intra-Muscular Osmotic Pressure — Stephane Leduc.
4. On the Interruption of the Current in the Primary Circuit of an Induction Coil — M. A. Turpain.

1. Barium platinocyanide changes under the influence of the X-ray from a pale green color and brilliant fluorescence to a brownish gold color without fluorescence. The experiments of the authors show this to be due to a dehydration and the regeneration of the color and fluorescence is due to rehydration.

Exposure to sunlight favors this, but air and moisture are the essential causes of regeneration. This can be prevented by placing the barium platinocyanide under a bell-jar with a dish of sulphuric acid, and exhausting the air. The other salts experimented with were of magnesium, which is vermillion before exposure to the X-ray and white afterward; ammonium, old gold before and yellowish red afterward. These changes are greatly influenced by heat, hence the test objects must be far enough away from the wall of the tube, if the change of color is used to measure the quantity of X-rays applied.

2. Mann says that there are many diseases in which electric excitability is not normal, but that the means of electrodiagnosis have so far been defective. The galvanic current gives widely different readings even during the same seance. His apparatus is somewhat simplified from that of Zanietowski. It has two condensers of a capacity of one-half and one microfarad, connection for charging and discharging, a potential reducer and a voltmeter. The electrodes were ordinary moist plates, the active one being of 3 square centimeters, the indifferent electrode being 5 by 10 centimeters. The condenser is charged at low voltage and this is gradually increased until a contraction is produced by its discharge. The reading on the voltameter gives the electrical excitation. He always uses one microfarad.

There is also a vibrator giving rapid discharges of the condenser to tetanize the muscles. The same nerve gives different readings on different days, but at the same seance, after twenty or thirty seances, the readings are the same. After faradic tetanization for ten minutes the condenser excitation required increases very markedly, but it is reduced after condenser tetanization. This may indicate that condenser discharges will be of more value than faradism in the treatment of paralysis.

Condenser discharges do not affect the resistance of the skin to the passage of a galvanic current, but the passage of a galvanic current very much lessens the condenser excitation. Different persons vary more in susceptibility to the condenser excitation than to the faradic. Children require a large amount of excitation (30 volts) and in tetanus only 6 or 10 volts are required. He considers that condenser discharges furnish a more exact method of measuring the electrical excitability of motor nerves in health and disease.

3. Leduc recalls the fact that substances in solution follow the ordinary laws of gaseous bodies, tending to occupy all the space that is open to them. A gramme molecule of any gas whatever occupies 22 3/10 liters at a pressure of one atmosphere, and if a gramme molecule of gas is enclosed in a space of one liter it has a pressure of 22 3/10 atmospheres.

Pfeffer and Van t'Hoff have measured the osmotic pressure of solutions of different substances and find that a gramme molecule of any substance in one liter of solution has an osmotic pressure of 22 3/10 atmospheres. This osmotic pressure is subject to the same laws as that of gases. The pressure diminished 1/273 of the pressure at zero for each degree centigrade below zero, and increases in the same ratio for each degree above zero. In the human tissues, consisting essentially of water with substances held in solution, the osmotic pressure is equal to more than seven atmospheres or more than a hundred pounds per square inch of surface. Osmosis is thus probably the cause of all vital phenomena.

The equalization of the osmotic pressures between two solutions through a membrane is much more due to a transfer of water than to a transfer of the substances in solution. In Leduc's experiments a frog is killed by section of the medulla oblongata and one posterior

extremity is cut off at the level of the groin with a single clip of the scissors. This limb is skinned, dried with blotting paper, weighed and placed in a solution of chloride of sodium with a freezing point of 0.53 C., and having consequently an osmotic pressure of 6 6/10 atmospheres at 15° C.

The other limb is excited through the sciatic nerve by an intermittent current passing once a second, for five minutes. It is then cut off, skinned, dried, weighed, and placed in the same solution. Results:

	Control (not excited)	Limb excited.
After 8 hours,	0.000	+0.050
After 16 hours,	0.000	+0.080
After 24 hours,	+0.006	+0.101

From this he concludes that electrical excitation, provoking muscular contractions, notably augments the osmotic pressure in the muscle. The figures given represent fractions of the original weight of the limb.

Other strengths of saline solutions were used and with similar results. The longer the electric excitation the greater the increase of osmotic pressure, and this is still further increased if the muscular contraction has been resisted by a weight attached to the frog's foot. Such considerable changes of the osmotic pressure in a muscle must necessarily exert a great influence over the production of fatigue.

4. The length of the spark from an induction coil depends, according to Turpain, upon the rapidity of the interruptions in the primary circuit. If the interruptions are sufficiently rapid a condenser may be dispensed with. He gives a diagram of a mercury dip interrupter with three rods dipping into three jars, the whole being connected in series, and in this way producing three small arcs instead of one large one. And also for the small rapidity of dip the duration of the interruption is shorter. Acting upon this principle of a series interrupter he has a brush interrupter with revolving contacts (copper and copper, or carbon and copper) the whole immersed in oil and forming a series when the contact is made. This can be arranged to give a succession of direct currents or a succession of alternating currents.

LE RADIUM

Paris, France, April, 1905

1. A Study of Phosphorescence — L. Matout.
2. Arrangement and Use of an Apparatus for Studying the Radioactivity of the Soil and of Deposits — J. Elster and H. Geitel.

1. In this the concluding article of several on the same subject, the author takes up first thermoluminescence, and then considers in some detail the various luminous effects that are produced by the various "rays," both material and ethereal, that have been discovered during the last ten years, and which may be said to form the basis of a new department of science, viz: radiophysics.

The action of the cathode rays on various materials, so beautifully illustrated by Crookes twenty-five years ago, is discussed at length and some more recent and convenient apparatus for extending such a study is described.

Next is given a survey of the X-rays, and the various phenomena produced by them are described and classified. A table of substances made luminous by the X-rays is given, but on examination it is found rather incomplete, omitting the substance calcium tungstate, which is notable for this property.

Lastly is discussed the phosphorescent action of the various kinds of rays emitted by radioactive substances, e. g., by radium, polonium, and actinium. The alpha, the beta, and the gamma rays are each considered, and

also the methods for separating the beta from the alpha rays. The behavior of these in a magnetic and in an electric field is described and experiments cited by which the phosphorescent action of each may be separately studied.

The emanations from radium, from thorium, and from actinium are also discussed with relation to phosphorescent action.

The conclusions arrived at by the author are that while many interesting facts have been found out, these lack coördination, and that much research work on the general subject yet remains to be done by physicists.

2. This is a brief article describing several special forms of apparatus designed by the authors for the particular use above stated. The measuring device is of the electroscope form, in which aluminum leaves are observed in motion over a graduated scale back of them. Several refined methods of observing the motion are described. The special ways by which nearly perfect insulation is brought about are given in detail.

The charging apparatus is especially designed and consists of 1,100 pairs of paper sheets of gilt and silver properly assembled to give a high potential pile.

The subject of the induced radioactivity due to an active deposit on a negatively charged wire is discussed and the apparatus used is described. The potential used is from 2,000 to 3,000 volts. A table of test readings made on radium and thorium is added.

LE RADIUM

Paris, France, May, 1905

1. Measure of the Heat Emitted by Radium Salts — A. Laborde.
2. Uranium-bearing Minerals and their Localities — P. Gaubert.
3. Bulbs in Medical Radiology — J. Belot.

1. The author's object in this article is to survey the several experimental methods for measuring the heat emission of radium. The first method described was that devised and used by Currie and Laborde early in 1903. It was only qualitative and consisted of arranging, under exactly similar conditions, a small tube of radium-barium chloride and one of pure barium chloride, each having a similar thermo-electric junction, the two connected in series with a sensitive galvanometer through a suitable commutator. The galvanometer when adjusted for maximum sensibility could indicate a difference of temperature in the two tubes of 0.01°. In this experiment the radium tube was 1.5° higher in temperature than the other.

Later, M. Curie employed a couple of Dewar flasks, one containing 7 decigrams of pure radium bromide and the other some chloride of barium. In these were carefully placed small mercury thermometers. It was noted that the thermometer in the radium salt read 3° higher than the other.

The above arrangement served also to measure the amount of heat emitted by comparing it with that emitted by a fine platinum wire of known resistance through which passed a known current of electricity.

Another method was the direct measurement by means of a Bunsen calorimeter, the rate of motion of the mercury column in the previously calibrated capillary tube furnishing data for calculating the rate at which the ice was being melted, and hence the rate at which heat was given out by the radium sample within.

Later, MM. Curie and Dewar measured the heat emitted by radium in a given time by noting under proper conditions the mass of liquid gas vaporized in the same time by the heat. Chloride of methyl at —21°, liquid oxygen at —180°, and liquid hydrogen at —252° were all used.

Rutherford and Barnes employed a

differential air thermometer which proved quite sensitive enough for the purpose.

Also Runge and Precht used Dewar bulbs and mercury thermometers.

Very different quantities of the material were used by the different experimenters, 700 mg. being used by Curie and Laborde, while Rutherford and Barnes had only 30 mg.

Assuming the atomic mass of radium to be 225, the generally accepted value of the heat emitted by 1 gramme of pure radium is 100 gramcalories per hour.

Experiment has shown an important relation between the radioactivity of a product and the heat emitted. For example de-emanated radium emits far less heat than the emanation. But the former gains, and the latter loses its emitting power at the same rate; and the sum of the two values at any instant is a constant and equal to that emitted by the radium originally, before the emanation was withdrawn. These results were obtained by Rutherford and Barnes.

All experimental results so far seem to be quite consistent with the disintegration theory of Rutherford and Soddy.

2. The author classifies these minerals as follows: I. Uraninites; II. Minerals of the Rare Earths containing Uranium; III. Minerals of secondary origin.

The composition and physical characteristics of the various uraninites are given in some detail, as well as some of the methods of analysis. Those especially mentioned are broegerite, cleveite (noted because helium was discovered in it) nivenite, and pitchblende.

Among the sources of the second class are described thorianite, uranothorite, the niobates and the tantalates, yttrotantalite, fergusonite, hjelmite, samarskite, anneroedite, pyrochlore, hatchettolite, polycrase, euxenite, and a few others.

A somewhat detailed account is given of the various minerals of secondary origin. They are classified as, *a*) The phosphates of uranium; *b*) The arseniates of uranium; *c*) The carbonates, the sulphates, and the vanadates of uranium; and *d*) The silicates.

Minerals containing uranium may be classified as to origin in two general groups, — those associated with pegmatite; and those found in mines yielding cobalt, bismuth, silver, etc. The localities in which the minerals of each of these groups occur in any quantity are stated, as well as the conditions under which they are found. The approximate yearly yield of Austria, England, United States, Norway, and Germany is given, with the value of the product in each case.

It is evident from the article that uranium is very widely distributed over the surface of the earth.

3. This article consists of a rather complete and detailed historical sketch of the development of the vacuum tube from the time of Crookes to the present. Many of the various types of tube are illustrated, and the explanations are clear and to the point. Very little is said about the great variety of shapes of tubes designed for special radio-therapeutic work, many of which are for sale in this country. In fact the omission of all things American makes the article no exception to the usual run of such publications. The self-regulating tube invented by Sayen, the first of its kind (and probably the best) is not even mentioned.

MISCELLANEOUS ABSTRACTS

THE EFFECT OF CERTAIN BATHS AND FORMS OF ELECTRICITY ON THE BLOOD, BLOOD PRESSURE, AND METABOLISM

William Bain, Wilfrid Edgecombe, and Herbert Frankling — *London Lancet,* April 29, 1905

This valuable contribution is the report of a series of experimental observations, undertaken to ascertain in a conclusive manner, what effect, if any, is exercised upon physiological function by the D'Arsonval high-frequency current; constant current and sinusoidal current immersion baths; combined electric light, high frequency, and ozone baths; radiant heated air baths (Dowsing system); non-luminous heated air baths (Greville system); Berthe and Vichy baths; peat baths; and thermal sulphur baths.

The points investigated were, the effect upon the total daily excretion of urine, urea, uric acid, sulphates, phosphates, chlorides, and the urinary acidity; upon the percentage of hæmoglobin and the red blood corpuscles; the white blood corpuscles; and the blood pressure. Sources of error were eliminated as far as possible by having the subjects treated placed upon a common diet for a week before the investigation began, during which period the normal standard of each subject was carefully determined; their conclusions were based upon the variations from this standard brought about by the application of the different therapeutical modalities.

D'Arsonval High-Frequency Current.

Auto-condensation caused a slight temporary rise in blood pressure (5 to 10 mm.); general effluvation a decided fall (10 to 11 mm.).

Hæmoglobin percentage was increased on the day following treatments but actual number of red cells was decreased on both days; hæmoglobin "value" of corpuscle was increased.

Total excretion of urine, urea, uric acid, sulphates, and phosphates increased; acidity markedly diminished.

Effluvation of abdomen caused increase in peristalsis and free passage of flatus for several hours after (sometimes diarrhœa), and slight rise in blood pressure probably due to splanchnic stimulation.

Constant Current and Sinusoidal Current Immersion Baths.

The water used was a mildly alkaline, sulphur water, bath duration 20 minutes, bath temperature 98° F., current strength (Sinusoidal) 60 ma.

No effect was observed upon blood pressure or constitution, or metabolism, other than usually follows such a bath without the electricity.

With the constant current (200 ma.) substituted for the sinusoidal, the fall of blood pressure usually observed when such a bath is given without electricity did not take place; hence the effect was to abolish such fall, probably by an actual slight increase in the arterial tension.

A slight increase in the urea and uric acid output followed this use of the constant current.

Combined Incandescent Light, Ozone, and High-Frequency Bath.

The patient was exposed, lying upon a glass shelf, to the radiance from a large number of incandescent lamps 18 inches from the body, constantly inhaling an ozonized atmosphere produced by a high-frequency brush discharge, for 25 minutes, and during the last 10 minutes a high-frequency current is passed through the body from a glass vacuum electrode held in the hand; a sponge bath completes the treatment.

The blood pressure was very greatly lowered by this procedure, the red corpuscles were increased, reaching a maximum number half an hour after the treatment, hæmoglobin value increased. It was ascertained by exclusion that this hæmoglobin rise was due to the ozone.

Total quantity of urine in 24 hours was diminished, urea output slightly decreased, uric acid and phosphates slightly increased, sulphates unchanged.

Radiant Superheated Air Bath (Dowsing) System.

Patients were treated for 30 minutes at a temperature of from 280° to 300° F.

Blood pressure fell 50 mm., red blood cells temporarily decreased, followed by an increase later, *marked reduction* in hæmoglobin value.

Urinary excretion markedly *diminished,* urea output and acidity *slightly reduced,* uric acid and phosphates slightly increased.

Non-Luminous Superheated Air Bath (Greville System).

Patient was treated at 300° F., for 30 minutes, which temperature was borne much more comfortably by the patient than 280° in the Dowsing apparatus.

Blood pressure dropped only 35 mm. (as contrasted with 50 mm. in the Dowsing apparatus at 280° F.), an immediate diminution in the number of red corpuscles took place, followed in half an hour by an increase, and a marked *increase* in the hæmoglobin value of the corpuscle, as contrasted with the marked decrease observed with the Dowsing treatment.

Urinary excretion *increased* about 25 per cent. (as contrasted with a decrease observed with the Dowsing system), urea excretion *increased* in total, but slightly diminished relatively, uric acid, phosphates, and sulphates increased.

Berthe and Vichy Baths.

This procedure consists of, first, exposure to steam at a temperature of 120° F. for 15 minutes, followed by 20 minutes of massage in the recumbent position under a spray douche at 98° to 100° F., then a needle douche beginning at 98° F., gradually reduced to cool or cold, after which the patient rests for an hour.

Blood pressure was increased, also hæmoglobin value slightly; slight rise in urea output, sulphate and uric acid excretions.

Peat Bath.

Peaty earth, highly charged with organic acids and a little iron, is steamed to the consistency of thick pulp at a temperature of from 98° to 104° F., the patient is immersed therein for 20 minutes.

Marked diminution in urinary and urea output only was observed.

Thermal Sulphur Baths.

No marked or noteworthy modifications were observed.

The therapeutic significance of the above observance will be immediately apparent when compared with the symptomatic and pathological phenomena present in the different diseases to which these modalities are commonly applied, and will also suggest additional directions in which their employment may prove to be helpful.

ELECTROTHERAPY

THE TREATMENT OF GRAVES' DISEASE

A. D. Rockwell, *Medical Progress*, Apr., 1905

In the treatment of this intractable disease the author holds that there are two aspects of the malady to be considered.

First, the general physical condition from which the disease has been evolved; second, the character and complexity of the individual symptoms. So far as concerns general nutrition, we will find its impairment associated in many cases with a diminished excretory and an increased secretory activity, together with more or less pronounced hysterical or neurasthenic manifestations.

On the one hand, we may have, according to some, a causative factor, analogous to that of myxedema, namely, a dysthyreosis, or diminution, or absence of the thyroid function. On the other hand, and in most of the cases without doubt, we find a condition of hyperthyreosis, or abnormal increase of the function of the thyroid. In cases of diminished thyroid activity, where we find also an increased electrical resistance, the thyroid extract will prove of service, and static electricity, whether by sparks, vibration or breeze, is distinctly beneficial. Increased activity of the gland — hyperthyreosis — demands an entirely different treatment. Here we find that the excretory and secretory functions of the body, and especially the function of the skin, are increased. We have heightened oxidation with decreased electrical resistance.

The treatment by thyroid extract is, in this condition, not only useless, but harmful, and static electricity is of doubtful utility. In some cases these methods of treatment have been known to very positively increase both the tachycardia and the general nervous instability.

The galvanic current, on the contrary, is strongly indicated, and seldom fails to do more or less good. In a very considerable experience in the treatment of Graves' disease, the writer's method with the galvanic current has been somewhat as follows:

The negative electrode — dimensions from five to ten centimeters — is applied over the cilio-spinal center, while the positive — dimensions from three to five centimeters — is applied along the inner border of the sterno-cleido mastoid muscle, from the auriculo-mastoid fossa to the manubrium sterni.

With regard to the strength of the current there is no question that, within bounds and broadly speaking, the stronger the current the better the result, but the limit of strength the operator must find out for himself in each individual case.

The current strength may vary from three or five to twenty milliamperes. In some cases very much more than twenty milliamperes can be utilized profitably. The second step in the treatment requires a change in the position of the electrodes. The positive pole, enlarged to the size of the negative as employed in the previous treatment (five to ten centimeters), should be applied to the cilio-spinal center (nape of the neck), and the negative electrode directly to the enlarged thyroid, and subsequently to the solar plexus. Here, again, the strength of the current is provisional, but the position and increased size of the electrodes allow greatly increased current strength. In some exceptional cases, as high as sixty milliamperes have been applied for a short time and without marked discomfort. The object is to get a density of current sufficient to affect the deeper tissues, and especially to positively affect the sympathetic itself.

A strength of only two or three milliamperes, as has been so often recommended, is mere child's play and is entirely ineffective for this purpose.

Supplementary galvanization of the method described and faradization of

the carotids is a useful procedure. How it acts is not altogether easy to say, but that the caliber of the enlarged and violently pulsating arteries may be at least temporarily decreased has often been demonstrated. This would seem to indicate that some of the secondary symptoms of Graves' disease are due to causes other than to an essential irritation of the peripheral sympathetic nervous system. It was Cyon's claim that, with the pituitary gland, the thyroid gland was directly concerned in regulating the cerebral circulation, and on this theory both galvanization of the sympathetic and faradization of the carotids and the gland itself, are rational methods of treatment for the purpose of accentuating nervous energy and giving tone to the arterial walls.

THE CONTINUOUS CURRENT IN RELATION TO INFLAMMATORY EXUDATES

Margaret A. Cleaves, *Medical News*, April 29, 1905

Following an exposition of the rationale of the action of the continuous current in inflammatory exudates the author goes on to say that to no body of men is the subject of inflammations and their sequelæ of greater interest than to the general practitioner. The intimate pathology of inflammation and inflammatory exudate is the same, no matter what organ or tissue is implicated, varying only with the anatomical site and structure and physiological function. The inflammatory process may occur during the progress of a typhoid fever, more rarely in these days of a puerperal fever; it may follow an operation for appendicitis or a uterine curettement, and in each and every such instance it is the venous distribution which suffers. The initial lesion may have been a para- or perimetritis which often, despite the best that classical medicine affords, stops short of full absorption of the products of inflammatory action. Masses of exudates remain in the pelvis, limiting mobility of the uterine organ, and drawing it to one side or the other. The broad ligaments, one or both, are thickened and contracted, and the ovaries are also involved in the exudative mass. Sometimes the process has been so extreme as to agglutinate all the tissues, completely roofing the pelvis in. The patient suffers from pain, weariness, dragging backache, dysmenorrhea and disability, as well as from reflex nervous phenomena. Normal circulatory processes are impossible, and by reason of the pressure of exudative masses, tissues and organs are not properly fed. When the process goes on to the formation of connective tissue bands the case is still further complicated.

In regard to the treatment it does not matter what tissue or organ is affected, so long as it is possible to apply electrode contacts so as to expend the chemico-physical energy of the continuous current directly upon or within the mass of organized exudate. The less fully organization has taken place the quicker and better the result. If it has gone on to the formation of connective tissue bands little can be done for them beyond the improvement of circulatory conditions, softening the morbid tissues, and putting them in a better condition for manipulation by the skilled masseur or for the action of an alternating current. But so long as masses of exudates (other than bands), encroaching upon cavities, infiltrating mucous membranes, matting together the various tissues, muscular and vascular, of a leg, surrounding articular surfaces or binding down sheaths of tendons are concerned, their absorption with restoration of function, complete or approximate, can be obtained painlessly and promptly by the use of a continuous electromotive force when other measures are of no avail. In this connection it may be said that the great dif-

ference of opinion concerning the results obtained in urethral stricture, a subject which has been pretty well threshed out in times past, has undoubtedly been due to incorrect differential diagnosis. Just so sure as the narrowing of the canal is due to the presence of the products of exudative inflammation in the mucous membrane limiting its caliber, just so sure can a result be obtained by the use of the continuous current tending to the increase of its caliber and restoration of function, but if the canal is additionally limited by the formation of connective tissue bands divulsion or cutting must of necessity be practiced as well.

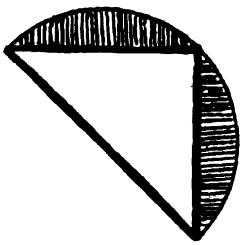
Seven illustrative cases follow, mainly of pelvic exudates, showing the excellent results which follow electrolytic treatment.

A NEW ELECTRO-CYSTOSCOPE

William K. Otis, *New York Medical Journal* and *Philadelphia Medical Journal,* April 1, 1905

Over twenty-five years have passed since the invention of the electro-cystoscope by Nitze, and although many modifications of it have been presented during this period, no one has succeeded in improving the ocular apparatus, so that the cystoscopes of today are no better, as far as fundamental principles are concerned, than those manufactured by Hartwig or Leiter in 1887.

The real optical difficulty which prevents an enlargement of the field of observation or an increase in illumination in the Nitze instrument, is due to the use of the prism as a means of diverting the light rays in order to obtain a rectangular view. From the opening of the window, or upper face of the prism, in this instrument, the rays of light must always travel a distance within the prism equal to its depth, so that if the angle of the lens is widened with a view to enlarging the field, this increase will be unavoidably cut off by the sides of the prism. In other words an attempt to increase the size of the field by increasing the angle of the lens results simply in bringing into view the sides of the prism. Moreover, it is necessary to have the prism proportionally so large that the telescope can have but a small lumen compared with the outside caliber of the instrument, and thus a large amount of light is lost.



Hemispherical lens and the angle of its plane surface.

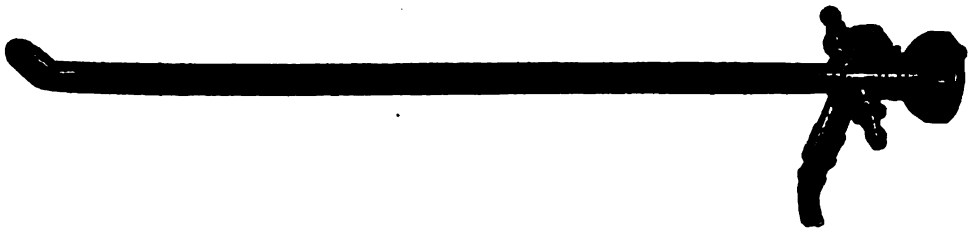
After a series of experiments extending over several years Otis succeeded in eliminating the prism by substituting in its place a hemispherical lens, the plane surface of which is silvered, a portion of the circumference filling and closing the window in the outer tube of the instrument. This procedure is in reality equivalent to the addition of plano-convex lenses to the superior and anterior faces of the prism.

This instrument resembles in general the cystoscope of Nitze, but differs from it radically in several most important particulars.

It consists of two separate parts, the external catheter or sheath carrying the illumination, and the internal or telescope, in which the entire optical apparatus is contained.

The distal extremity of the external portion consists of a short beak (½ inch) set at an obtuse angle, containing the electric lamp in its tip.

This lamp is of peculiar construction and deserves special mention on account



THE OTIS ELECTRO-CYSTOSCOPE. (½ its actual size.)

of its wonderful brilliancy and its freedom from heat. It is set so as to form the extreme end of the instrument, the light, unimpeded by any metal hood, illuminates the whole bladder. Its size is equal to the full external caliber of the instrument, and it is set in a metal socket or tip which screws into place after the manner of the lamp in the Nitze model.

One pole of the lamp is carried on the metal of the shaft itself, the other by a specially insulated wire, which does not encroach upon the internal caliber of the shaft, and permits the use of a telescope several sizes of the French scale larger than that of other instruments, thus allowing the passage of a greater amount of light with a corresponding brilliancy of field.

The shaft has a working distance of eight inches (i. e., from the center of the window to the apex of the ocular funnel) and in the commercial instrument, a caliber of 20 F. At the angle where the shaft joins the beak on its superior surface, an oval window is cut through the metal to expose the lens of the telescope when in place.

On the superior surface of the proximal end is a short screw, at right angles to the shaft, on top of which a small ball is fixed, which indicates the position of the beak when the latter is in the bladder. A thumb-nut on this screw serves to clamp the telescope firmly in position. On the inferior surface of the proximal end of the shaft is a metal post with an insulated core which carries the electric terminals of the lamp and connects with the cords from the battery by a screw socket. A turn of this screw permits the lamp to be lit or extinguished at the will of the operator. Small stop-cocks communicating with the internal caliber of the instrument have been placed just above the post, for the introduction of air, for use when it is considered desirable to use air instead of fluid as an examining medium.

The telescope contains the entire ocular apparatus. On the superior surface of its distal end is a window cut in the form of the upper opening of a whistle, in which is set the hemispherical lens.

The proximal end consists of a funnel eye-piece with a movable collar at its apex to which is fastened a small flat fork or crotch, the prongs of which pass on either side of the screw on the shaft and serve to clamp the telescope firmly to the sheath with the thumb-nut, at the same time allowing the telescope to turn on its own axis. A partial rotation of the telescope in this collar causes the lens at the end to slide from the window of the sheath, the opening then being filled by the back of the telescope, the lens facing the back of the sheath. In this way the cystoscope is introduced into the bladder, being entirely protected from any contact with blood, pus, or lubricant which is most desirable when using a fluid medium and absolutely essential when air is employed.

After the instrument is well in the bladder the lens is brought into the window by rotating the telescope, a small knob on the ocular funnel indicating its

correct position. Should the fluid in the bladder become clouded at any time on account of bleeding or the presence of pus, it is only necessary to remove the telescope, the sheath acting as a large catheter, permits the rapid withdrawal of the fluid contents of the bladder, which can be refilled, the telescope replaced and the examination continued with but little loss of time and without removing the instrument.

The practical advantages claimed over other like instruments are as follows:

A field of observation having an area four times as large as that of any other rectangular cystoscope; with no other cystoscope does the field of examination *compare in distinctness and brilliancy* with the picture as seen through this cystoscope *covering a four times greater area.* Nor have they the penetrative power, or the ability to see distinctly at a distance from the object, as no matter how much the bladder may be distended, a clear image may be obtained from any part of its interior with this instrument.

The arrangement and quality of the lamp and the large caliber of the telescope, rendered possible by the special device for insulating the second pole of the lamp and the elimination of the prism, gives an illumination of field better than in other cystoscopes, on the principle that more light will pass through a large tube than a small one.

The lamp, the filament of which is prepared by a secret process necessitating a very high vacuum, has such a low amperage that it emits almost no heat, making it impossible to scorch or, as has happened, seriously burn the bladder wall.

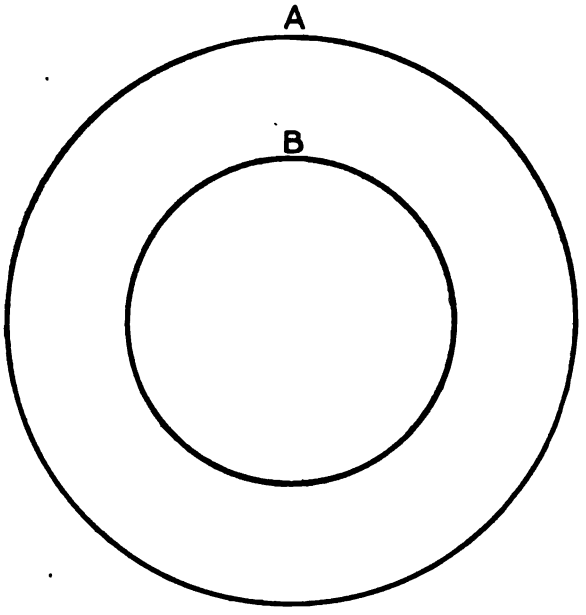


FIG. 3 — The outer circle (A) represents the field of the author's instrument at a distance of one and a half inches from the bladder wall, the inner circle (B) the field of the Nitze instrument at the same distance.

This cool, powerful lamp, together with the protection of the lens from being smeared during introduction, permits the use of air as the examining medium should this be considered advisable.

The short beak and absence of the flat top and sharp, angular sides of the prism, render it easy of introduction and less liable to cause bleeding.

Should the medium in the bladder become clouded, it may easily and rapidly be withdrawn and replaced without removing the instrument.

SOME POINTS IN THE CONSTRUCTION OF A HIGH-FREQUENCY MACHINE

Clarence A. Wright, *Medical News,* April 15, 1905.

This author favors the ionic theory to explain the passage of a spark between prime conductors and quotes experiment as authority to prove that a spark gap is ionized from the negative pole. In other words, that the free negative corpuscles are driven violently away from the negative polarized prime conductor, and meeting the atmospheric molecule, are arrested in their flight by delivering their energy, which disassociates the molecule from its ions.

He directs attention to the well-known Eddy effect of a condenser discharge, as being a factor in producing ionization; and the positive ionization of the air surrounding the spark gap.

He also calls attention to the fact that ultra-violet rays are emitted from a condenser discharge and that they are a factor in disturbing the arrangement of the molecule.

He quotes authority to show that oscillations are more frequent when a condenser discharges in the light. He also shows that more amperage will be derived from the apparatus when it discharges through a multiple spark gap; and further, that aluminum, owing to its property of absorbing hydrogen, makes the most satisfactory material for the small spheres to be used in the multiple spark gap.

He advocates a spark gap that is placed in a tube of nitrogen, and multiple inductors connected to a coil of great self-induction in shunt.

He calls attention to the observation of Thomson and Meys that the cathode exhibits a small drop of potential when the electrodes are new, and an increasing drop as they get old.

He quotes Schuster and Hemsaleth as proving that it is only the first spark that passes through air, the following sparks through a vapor of the metals of which the terminals are formed. He emphasizes the important fact that the capacity of the condensers may be altered by altering the position of their armature in relation to each other.

THERMOTHERAPY

APPARATUS FOR APPLYING HOT AIR TO THE EAR

Albert C. Heath, *Jour. A. M. A.,* April 29, 1905

Albert C. Heath describes an electrical apparatus that can be used with any cautery battery for applying heat to the ear. He claims for it the advantage of proper graduation of the temperature by means of the rheostat; the possibility of definite application by means of the otoscope simultaneously employed; lack of danger of burning; simplicity of construction and management, etc. The air is heated by the cautery apparatus and forced through a rubber tube into the ear. By this means he claims the application of heat to the ear is made a definite therapeutic procedure, the amount being controlled and the application directly observed.

RADIOTHERAPY

THE THERAPEUTIC USE OF X-RAYS (THREE YEARS AFTER)

W. A. Pusey, *Jour, A. M. A.*, May 13, 1905

The personal experience of the author is set forth at length in the various conditions amenable to treatment. In hypertrichosis satisfactory results have been obtained in fifty per cent. after long painstaking treatment. Experience has shown X-ray less satisfactory in this condition than was anticipated.

In sycosis and tinea the results are permanent to the extent of three years and obtainable by no other means. The improvement in cases of acne is little short of marvelous, and where partial failure has resulted, he believes it to be due to failure to obtain enough X-ray effect. The application of the ray in acne requires experience, care, and treatment extending over several months. No unfavorable after effects have been seen. The method is most useful in severe cases of acne indurata.

The results in rosacea are as satisfactory as in acne. The nose frequently becoming normal in color and contour with disappearance of dilated blood vessels. The tendency to relapses in such cases is slight.

In the inflammatory dermatoses experience has shown the rays to be of great value, particularly in the chronic eczemas, and marked relief from itching is frequently seen.

In psoriasis and lichen planus, beneficial results are obtained. In lupus erythematosus the rays are inferior to the application of high frequency. Considerable relief has been obtained in cases of pruritus. In pigmented and flat vascular nevi, the X-ray treatment possesses decided value. Where such lesions are covered with hair, this may be removed and the skin become almost normal.

Keloids flatten down into soft white scars under this treatment. Pusey has seen but one case of lupus vulgarus which failed to yield to the rays, a deep-seated case of lupus of the face recurrent after operation. The few failures which he has seen in lupus have been due to failure to carry out the treatment. He believes that he can duplicate with the X-ray all the results obtainable by Finsen's method and with more rapidity. The treatment is also applicable to mucous membranes and will reach deep-seated lesions. It requires no caustic supplement, is applied without discomfort to large areas at a single sitting, and extensive cases can be treated in much less time than is possible under Finsen's method.

In the treatment of cervical adenitis with involvement of the skin the sinuses heal and the glands disappear. In tubercular joints a great deal of good can be accomplished. The discharging lesions heal and the swelling decreases.

In abdominal tuberculosis he believes the method is worth careful trial. Several cases of blastomycosis have shown favorable results when combined with potassium iodide in ten to twenty grain doses.

Two large suppurating papillomatous tumors, one on the knee and the other on the thigh, which had resisted ordinary methods of treatment, were completely cured, with no recurrence. One case of actinomycosis of the jaw was followed by complete restoration under a few weeks' treatment. In a case of supposed sarcoma of the left side of the breast, with indurated glands in both axillæ, the mass over a foot in diameter and three inches thick, completely disappeared under X-ray treatment alone. The cachexia disappeared, patient was completely restored to health, with no recurrence in over two years.

In epithelioma, Pusey's results have been giving him the utmost confidence in

the use of the ray in this condition. He is inclined to believe that any cutaneous carcinoma can be cured with the ray, if we exclude metastases or deep extension into the underlying tissues. He believes all epitheliomas suitable for this method of treatment, except those cases in which conservative surgery requires removal of contiguous glands. The method is especially useful in epithelioma of the nose, ears, eyelids, and cheek. He calls attention to a type of epitheliomas of the nose rarely seen, of rapid growth, deeply seated, with large nodular masses at the border of the ulceration, which melt down rapidly under treatment. Such cases do not do well.

The same may be said of extensive carcinomas of the orbit. In several cases Pusey has been surprised by the recovery of the patient, after the treatment had seemed to fail. In these cases, after the usual routine treatment had failed to produce results, cure followed massive doses of X-ray.

He sounds warning against the treatment of epitheliomas of the lower lip by any method which does not involve the removal of the subcutaneous glands. He has treated twenty cases of epithelioma in this location, in nineteen of which there was no glandular involvement; each of these cases gave healthy scars. The other case had large submaxillary glands and this case failed. All can be done by X-ray in these cases that can be obtained by any other method of treatment if the glands are not removed. The method is one to be considered when the radical operation is unnecessary or impracticable. Very extensive epitheliomas in other locations have been treated with a permanency of cure extending over three years.

Pusey has never had a sloughing X-ray burn in a case of epithelioma, though he has run the risk of it many times. He has treated a large number of recurrent carcinomas of the breast, in many cases with surprising results. These cases were hopeless, but experience has taught him to treat every case which did not show mediastinal or pulmonary or distant metastases. While he has met with many failures in such desperate cases, yet in almost every case the treatment has been well worth while, and in many cases results have been obtained which have so far been permanent. One case recurrent for the third time and refused operation by Dr. Ochsner, has remained symptomatically cured since September, 1901, in good health and able to earn a living.

X-ray treatment of primary carcinomas of the breast should not be undertaken when operation is feasible. Post-mortems on primary carcinomas submitted to X-ray have shown the tumor converted into a small fibrous mass of connective tissues, containing but little gland tissue, and *no carcinoma*. In 15 cases of primary carcinoma, six of which were absolutely hopeless, seven are living from one to three years after treatment, with the disease either absent or very greatly diminished. In carcinoma of the abdomen and pelvis, Pusey has had some favorable results, mostly in the way of palliative treatment. He believes sarcoma is affected by X-ray practically the same as carcinoma and somewhat more readily, the *unfavorable results being due to the presence of metastasis at the time the case was first seen.*

He is a firm believer in the prophylactic use of the X-ray following operations for malignant disease. He does not believe that it is possible to *spread* a carcinoma or sarcoma by exposure to the X-ray. He has never seen a metastasis occur that it seemed reasonable to attribute to such cause.

In most of the cases of goitre, he has seen no benefit. He reports a remarkable case of true leukemia which made a rapid recovery under exposure to the rays.

DIETETIC EXERCISES IN INFANT FEEDING

E. Kirkland Shelmerdine, *New York Medical Journal* and *Philadelphia Medical Journal,* May 6, 1905

Infants who require artificial feeding can be divided into three groups: 1. Easy cases; 2. Difficult cases; 3. Very difficult cases.

1. *Easy Cases.* Properly fed babies have universally a bright, sunny disposition. Improper proportions of the fundamental constituents of milk result in abnormal chemical changes in the food, errors of metabolism, and peevishness in the infant. Proper modifications of milk should be made for all infants who require to be artificially fed. The casein of cow's milk is much more difficult of digestion than human milk, and the digestive organs of the child should be educated to the point where they can digest whole cow's milk, by gradually increasing the proteids from a low to a high percentage, during the first year of its life, starting with 0.75 per cent., and ultimately reaching 3.5 per cent. At the beginning of the second year plain milk is given.

2. *Difficult Cases.* Improper feeding is the main etiological factor in malnutrition, marasmus, rickets, scurvy, and the various gastro-intestinal disturbances. In a child who is being improperly fed, weight and length are below normal; there is lack of muscular tone; the child sleeps badly, is restless, peevish and irritable; the digestive and assimilative organs have impaired functions, causing vomiting, diarrhœa or constipation; anæmia is generally present; teething is delayed; the ability to sit up is acquired later than usual; holding up of the head for any length of time is an obvious effort, and emaciation and feebleness are pronounced.

Too much or too little of either proteid, fat or sugar, may cause disturbance of the digestion. Proteids are the main cause of trouble, next comes fat, and rarely sugar.

Too much proteid may cause gastric or intestinal colic, often vomiting, constipation, or, less frequently, diarrhœa, alkaline stools, pale yellow or white in color, sometimes formed and with an odor of cheese, at other times foul, and containing large masses of casein insoluble in alcohol and ether.

Too little proteid is indicated by malnutrition, low muscular tone, and deficiency in length and weight.

Too much fat may be accompanied by vomiting of sour masses of food, diarrhœa with loose movements of a yellow or yellowish green color and sour odor, sometimes white, smooth, and formed, with a peculiarly offensive odor, of acid reaction, and containing free fat, which may appear as small, yellowish-white masses, soluble in alcohol and ether.

Too little fat may cause constipation, malnutrition, and cold extremities.

Too much sugar may give rise to gastric or intestinal flatulence, sometimes to vomiting, and to colic and diarrhœa, alternating with constipation, and to offensive stools, thin, sour, and frothy.

Too little sugar is indicated by excessive leanness.

In these cases it is a good rule to start with a milk containing 2 per cent. of fat, 0.75 per cent. of proteid, and 5 per cent. of sugar, and gradually increase these proportions, if no symptoms arise indi-

cating a too high percentage of any of the ingredients.

3. *Very Difficult Cases.* Feeble digestion or chronic indigestion generally is due to previous improper feeding, and is not the result of inherited defects. Some few infants are unable to digest even very low percentages, especially of proteid. In such cases, after cleaning out the child's digestive tract by small doses (gr 1/10) of calomel followed by castor oil, grain water may be given for a time, and then a low percentage of proteid may be tried again, or a whey mixture may be given at the start. Whey is prepared by adding half a junket tablet to a pint of milk. After coagulation has taken place the curd is broken up by stirring, and the liquid is strained through a muslin cloth, without pressure. This is diluted with boiled water, and then is added to it lime water, cream and milk sugar. The percentage of proteid, at first very low, is gradually increased, as the infant acquires the capacity for digesting it, until the whey can be discontinued and the child put on regular modified milk.

By this graduated exercise of the digestive functions, the alimentary tract is trained to digest increasing percentages, until the child is finally receiving an adequate amount of nourishment.

THE DIET IN TYPHOID FEVER

John Benjamin Nichols, *American Medicine,* May 6, 1905

This article is an argument for the abandonment of an exclusive milk diet.

The guiding principle in the dietetic management of typhoid fever is the proposition that typhoid fever patients should be fed and nourished as liberally as possible, within the limits of their capacity for digestion, and avoiding special harmful effects. The essential requirements for such a diet may be considered under four heads: (1) nutritive value; (2) digestibility; (3) palatability; (4) innocuousness.

(1) *Nutritive Value.* No matter how much the food is increased, the destruction of body tissues during the stage of pyrexia continues to keep in excess of what can be made good by the food. The daily loss of typhoid patients during the febrile period is usually from 200 gm. to 500 gm. (7 oz. to 16 oz.). A study of 137 metabolism observations, made by 11 different observers, in 73 cases of typhoid fever, seems to show that the best results are obtained when from 100 gm. to 110 gm. (3½ oz.) of proteid per day are fed to the patient, if he is a person of average size, who weighs 70 kilos (154 pounds). The daily amount of fat given should range from 50 gm. to 75 gm. (1⅔ oz. to 2½ oz.) and of carbohydrates from 270 gm. to 213 gm. (9 oz. to 7 oz.) — the larger amount of carbohydrates corresponding to the smaller amount of fat, and vice versa. In addition from 2 liters to 3 liters (quarts) of water should be given daily. This promotes the digestion and absorption of food, flushes out the bowel, keeps the fæces soft, washes out the products of intestinal putrefaction, dilutes the toxic blood, promotes the elimination and excretion of toxins by the kidneys and skin, and replaces the large amount of water which is lost from the tissues during the continuance of the fever.

(2) *Digestibility.* On this point metabolism investigations seem to show that the digestive and absorptive capacity of typhoid fever patients is only from 5 per cent. to 10 per cent. less than that of healthy persons — for moderate amounts of foods, which are not notoriously difficult of digestion. Furthermore the difference between digestion in health and in typhoid fever is less than the difference in health between various articles of food ordinarily regarded as digestible.

(3) *Palatability.* If the food is pal-

atable, appetizing, and agreeable, it will conduce to the patient's comfort, and he will more readily take a larger amount of nourishment.

(4) *Innocuousness.* Any food which causes or contributes to gastric irritability should be avoided. Also such foods as promote fermentation in the intestine, or cause or increase diarrhœa. In order that no damage may be done to the intestinal ulcers, there must be no great distention of the intestines by gas, no excessive peristaltic action, good general nutrition, and no solid or bulky masses of food residue. Therefore the food should be of such a character, and so prepared, that the residue in the intestine shall be fluid, or in a state of fine division, non-irritating, of minimum bulk, and kept well softened or in a semi-fluid or pasty condition by water.

No solid food can cause more intestinal indigestion or irritation than milk often does. Of all foods which can reasonably be given to very ill patients milk is or may be the most solid, since no other food is capable of passing through the entire intestinal canal and being ejected with the feces in such large or hard masses. There is little danger of overloading or clogging the circulation with superfluous nutritive materials. The danger of increasing or of causing the recurrence of fever is less than is generally believed, and may be avoided, if changes in the dietary are made gradually, watchfully, and cautiously, never suddenly. Milk, on account of the calcium salts which it contains, and gelatin, by its hemostatic action, may be expected to be of value in cases accompanied by hemorrhage.

Articles of food available. Milk, if used exclusively, would need to be given to the amount of three liters (or quarts) in twenty-four hours, in order to yield the amount of protein and energy which seems to be desirable. It is not often practicable to give this amount. The total solids of milk are less digestible than those of eggs and meat, its fecal residue is much greater, and it requires an equal length of time for digestion. Of ordinary animal foods, milk is one of the least digestible. It may cause the most severe form of intestinal indigestion, with fermentation, production of gas and irritant toxins and diarrhœa. It may pass through the intestine in large and solid masses. The appearance of curds in the stools is an invariable indication for the immediate reduction or entire withdrawal of milk.

Soups have very little food value in proportion to their bulk.

Eggs are highly digestible and easily absorbed. They are free from objectionable features, and form one of the most valuable articles of food. The whole egg should be given, and should be either poached or soft-boiled. Beginning with half an egg, or a whole one each day, the amount may be gradually increased until, in many cases, four or more eggs may be taken daily with safety and advantage. Custards (steamed or baked) and plain ice cream are useful additions to the diet.

Meat is the most concentrated and most efficient natural source of proteid, and is one of the most digestible and least irritating of all foods. If properly divided before reaching the stomach it becomes practically fluid in the alimentary passages. The alleged dangers of meat are largely mythical. Beef, lamb, chicken, and fish may be used. They should be broiled or roasted, and finely minced either before or after they are cooked.

Vegetables and grains should be used with some caution. Rice, corn starch, flour products, such as bread and crackers, and baked potato are available.

The various proprietary foods are less satisfactory than ordinary food in most cases; but, where there is great gastric intolerance of other food, they may be tried with the hope that some one of them may be retained, and such nutri-

ment and stimulant as they contain may be utilized.

The intervals between feedings should not be less than two hours.

Rectal feeding should be utilized when the stomach is extremely intolerant of food.

The advantages of a liberal mixed diet have not had a chance for demonstration in extensive series of cases, neither have its alleged dangers been really shown. The fact that most patients recover on milk does not prove that other food is dangerous.

The writer reports twenty-three cases of typhoid fever, in which the patients were fed more or less liberally, with one death. He has collected one thousand cases, in which the patients were treated on the enlarged diet plan, with seventy-seven deaths — a mortality of 7.7 per cent.

So far as can be judged from general impressions, in the absence as yet of sufficient exact comparative statistics, it is probable that liberal feeding may be shown to be capable of slightly shortening the course of the fever. There is general and positive agreement among the writers that the duration of convalescence is materially shortened in the well-fed patient.

MECHANOTHERAPY

TREATMENT OF GONORRHEAL ARTHRITIS BY HYPEREMIA

Johannes von Tiling — *Jour. A. M. A.* April 29, 1905

Johannes von Tiling has secured excellent results from Bier's method of damming back the circulation with elastic bands in several painful cases of gonorrheal arthritis. He advises the use of a thin, pliant rubber bandage, applied so as not to cause discomfort, but sufficient to produce very perceptible hyperemia. Blueness and coldness of the limb, white or vermilion spots and pain or paresthesia indicate that the bandage is too tight and should be loosened. Properly applied, the most marked first effect is relief of pain, but this is not all: damming, he claims, has a bactericidal effect, and dissolves away the adhesions which are completely removed by massage after the removal of the bandage. At first the bandaging should be of short duration, a few hours at a time, but later it should be increased until it reaches ten hours a day and ten hours at night. After removal of the bandage, massage lightly, then have the patient stand and move the joints. He claims that this method gives better results in most cases of gonorrheal arthritis tending to stiffness of the joints than any other.

PSYCHOTHERAPY

SOME OF THE PRESENT PROBLEMS OF ABNORMAL PSYCHOLOGY

Morton Prince, *Psychological Review,* March and April, 1905

This paper, presented at the Medical Congress at St. Louis by a man of great experience, calls for a more careful reading than can be given it in the summary to follow. As an American presentation of study in abnormal psychology it deserves a position among the papers of the foreign savants in this section. The problems handled are vital to psychopathology and psycho-therapy, and for that reason should be carefully considered by the thinking man.

Dr. Prince divides abnormal phenomena into first "Dissociations of con-

scious states," including in this, amnesias, as dissociation of memory; anæsthesias, or dissociation of sensibility; paralyses, or dissociations of motility; and alterations of personality; secondly he makes automatisms to comprehend those states beyond the control of the personal consciousness and to involve the abnormal syntheses such as fixed ideas, impulsions, convulsions, and perversions of other states.

He looks upon these phenomena as normal processes of mind submitted to changed conditions as did Virchow in a general sense. As such we proceed from the physiological as seen in dreams, sleep, absent-mindedness, etc., thence through the artifacts such as hypnosis to the pathological states seen in hysteria, trance states, alteration of personality, hallucination and certain psychoses transitional in character.

The concept of mind, not as a unity, but as a multiformity, is briefly dwelt upon in a purely psychological manner with no biological implications. In this connection he reviews in a preliminary manner the effect of mind on body and the possibility of applying to these problems scientific methods.

Viewing the mind as a multiformity, he raises the question as to whether subconscious states have an habitual existence or whether they are abnormal and artifacts. It becomes clear that by subconscious states he means the synthetized states, not the desultory, casual phenomena, for he re-puts the question thus: "Does the subconscious form a unity or not?" In answering this, he brings forward much experimental evidence from work in hypnosis to support his conclusion that "While a greater or less number of isolated dissociative states are constantly recurring under normal conditions, no satisfactory evidence is to show that they normally become synthetized among themselves and exhibit automatism except in states of abstraction and as artifacts." It is an eminently sound position and does much to sweep away a good deal of nonsense about our deeper self, which is a genius, an omniscient self, or a buried saint, according to the particular brand of metaphysics consumed by the various writers.

As to the mechanism of dissociation, after mentioning Janet's partially physiological hypothesis of fatigue, and Freud's purely psychological one of exclusion or narrowing by a prepotent hypnoid state or idea, he recurs to the physiological in the ultimate reference to the neuron systems, as it is shown that while syntheses follow the psychological, the lines of disaggregation follow the physiological.

CASE OF SOMNOLENTIA (SLEEP DRUNKENNESS)

E. M. Taylor, *Boston Medical and Surgical Journal,* April 8, 1905

The patient in this case had been a somnambule for years. That which brought him to the physician was an extension of this wandering. On several occasions he had found himself in hazardous positions, in which it seemed that he was fully awake and remembered exactly as to how he had gotten there. But it is equally evident that he was not fully awake, for the new and strange situation produced this state and it was noted as a change from that immediately preceding. As, however, he became fully aroused, there was no amnesia, he remembering just as to how he had arrived at the given situation. This would seem to imply that he had not been conscious of his actions during all the time of their performance, but that this amnesia was temporary and recoverable.

The entire train of symptoms fell in with a dream in which he was pursued and cleaned, so as to avert the possibility of pools of water remaining between the tiles or in the gutters. Ornamental vases or other possible receptacles for

YELLOW FEVER AT RIO JANEIRO

Dr. Le Marchoux, *Annales di Hygiene et de Med. Colonialis,* Paris, France, April May, and June, 1905

Le Marchoux states that the new methods of prophylaxis against yellow fever were inaugurated at Rio Janeiro in April, 1903, but they were local in their operation and did not embrace the whole city until January, 1904.

These measures include two objectives: (1), the destruction of the existing mosquitoes; (2), the prevention of the development of the larvæ.

The first measure comprehends the isolation of the patient and the immediate destruction of all mosquitoes in his vicinity, possibly already infected. The regulations require that every case, even those hardly suspected, be reported at once to the health authorities. In one hour after notification a squad from the sanitary bureau is on the scene. Each window of the patient's room is furnished with an impassable metallic mosquito-netting. An automatic device consisting of a double diaphragm or tympanum composed of mosquito-netting is fitted to the doorway, and so constructed that the two parts cannot be operated at the same time; one cannot be opened until the other is closed.

The other rooms of the house are now to be fumigated. Each room is made as tight as possible by the closing of all apertures. Pyrethrum in the proportion of two grams per cubic meter of the space of the chamber (or sulphur, if the nature of the furniture permits, eight grams per cubic meter) is now burned. Pyrethrum, it appears, does not kill the mosquitoes, but at the end of one hour they are found on the floor in a state of temporary stupor. They must be swept up and burned. Neighboring houses are to be treated in a similar manner.

If the patient dies his chamber is at once treated like the others to destroy any chance mosquitoes. In case of recovery the patient is isolated seven additional days and is then removed to another room so that the sick chamber may be fumigated.

The measures against the habitats and breeding-places of the insects are more difficult of accomplishment. A force of 1,500 men is employed for this work. These are divided into squads of two men with a chief, who are sent into divers quarters of the city armed with liberal supplies of petroleum. Each house is visited once a month. The workmen are cautioned to be polite to the occupants and to enter no house without authority. At the first visit the premises are gone over with great care. It is ascertained whether all permanent water receptacles are properly covered. The retired corners of the house and outhouses are carefully explored for old barrels, jugs, bottles, flower pots, or other receptacles which may contain water. The roofs are visited, swept, and had to escape in some way. This dream relationship, which is most interesting, is not developed nor is there any evidence of that experimental work on such a case which only can clear up its pathology. The dreams often go back to childhood for their genesis and upon them many times has been built an almost subconscious systematized delusion producing a series of phenomena which are most blind until the real organization is exposed.

water are also examined. Any articles broken during the inspection are paid for or replaced without delay. The inhabitants are instructed as to simple sanitary rules and admonished to be careful. If at a subsequent visit the directions are found to have been disregarded, the proper authorities are notified and punishment visited upon the recalcitrant householder. Ornamental fountains and basins must also be carefully inspected.

In public parks, plazas, etc., these are generally emptied and replaced by beds of flowers. If it is decided to retain the fountains a little petroleum is added to the water occasionally. In certain cases where fountains contain fish, which it is desirable to preserve, a small number of the finny tribe, commonly known as the bariguad, is placed in the water. These little fish are believed to be very fond of the larvæ of the mosquito. Their employment at Rio, however, has not been attended with success. Either the larvæ escape them or they themselves fall victims to larger fish.

The general results of this prophylactic crusade have been exceedingly gratifying. If the stegomyia has not completely disappeared, his ranks have certainly been greatly thinned. The mortality statistics show that in the year 1896 (an unusually bad year, however), there were 3,974 cases of yellow fever in the city. In 1902 (about an average year) there were 1,284 cases. While in the year 1904, just past, omitting December, there was a total of only 53 cases (two of these afterward proved to be cases of pest). These results afford a striking confirmation of the mosquito theory of the origin of yellow fever. Few there must be today who doubt the blood-guiltiness of the Culicidoe in the spread of this disease.

FOREIGN LETTER

CONCERNING THE DISTINCTLY FAVORABLE ACTION OF THE X-RAY IN CASES OF NON-SUPPURATIVE TUBERCULAR ADENOPATHY

The cases in which the favorable action of the X-rays upon tubercular adenopathy has been noted are as yet too rare for us to present results with desirable certainty. I have had occasion, however, within the last six months to treat with the X-rays four persons suffering from non-suppurative tubercular adenopathy with the following results:

Case I. — Young woman, 24 years of age, had suffered from girlhood with ganglionic adenopathy of one side of the neck. General condition good. Nothing wrong with the lungs, the trachiobronchial tract scarcely affected. The lower and posterior groups of cervical glands were involved, forming an induration, movable upon the adjacent surfaces. It was the size of a flattened nut.

Numberless medications had been unsuccessful, applications of caustic pastes had produced adhesions of the skin and vicious scars. Five treatments of radiotherapy at intervals of 15 days, then at intervals of a month, rays No. 5 of Benoist's radiochromometer, 2 to 3 H. each time, were given.

From the first treatment there was a sensible amelioration. Today there is considerable diminution in the size of the glands; division of the induration, which is scarcely noticeable; and the scar is flattened and of a good color. The general condition is perfect.

Case II. — Young man, 22 years of age, recurrence of a group of enlarged cervical glands which appeared four years before. Two years before two of these glands whose nature had been correctly diagnosed, were removed. In spite of divers treatments, medical and physical, the development continued.

Today the lymphangitis extends on both sides, considerably disfiguring the face and neck. On the right side the parotid, mastoid, cervical, and submaxillary glands form one hard, prominent mass, the one under the lobe of the ear being the size of a hen's egg. The glandular mass on the right side is united to that on the left (which is much smaller)

by a line of submaxillary glands the size of pigeons' eggs. The tracheo-bronchial tract is very nearly normal, the heart is feeble, no involvement of the lungs. General condition good.

Eight treatments of radiotherapy, same rays as in Case I, light-intensity 2 to 3 H. each week, resulted in a slow but distinctly favorable change. Four treatments more (5 and 6 H.) every 15 days resulted in the production of a superficial dermatitis which healed quickly.

Result favorable, the last treatments being much more effective. Face is almost symmetrical, the glandular mass on the right side is reduced three-quarters, the glands movable and separated, rolling under the finger. On the left almost nothing remains. The subclavicular glands not treated have not decreased in size. General condition as good as before if not better; no evil effects.

Case III. — Woman, 30 years of age, of tuberculous heredity. General condition good. Had cervical adenitis from the age of 14, always progressing. Today there is on the left a chaplet of cervical glands, two of which are the size of a large nut, producing very marked disfigurement of the face. On the right the chain is much smaller, the cervical submaxillary, and two mastoid glands being about the size of a big almond.

Five treatments administered at intervals of 25 days, same rays as were used in preceding cases but of stronger intensity, slightly tanned the skin and resulted in a considerable amelioration. The left cervical region became free and the size of the biggest gland was reduced to the size of a little almond without the shell. On the right there were no more submaxillary glands palpable. Those in the mastoid region which were not treated did not decrease in size.

Case IV. — Young girl, 17 years old, very large and very strong. Voluminous lymphangitis of the left axilla filling the whole arm-pit, pushing forward and deforming the whole region. There was a single mass the size of a large orange cut in half. There was no pain, no adhesions, no fluctuations. Slight cervical enlargement on the same side without parotid or submaxillary involvement. Heart feeble. Symptomatic variations of temperature were present in the evening while she was undergoing treatment at the Air Cure of Archachon; had tried various treatments without beneficial results.

Five applications of radiotherapy, given at intervals of a week, same rays as in the preceding case, produced little amelioration. Three later treatments at 15 days' intervals were followed by slight dermatitis or reddening of the skin, followed by tanning, and produced considerable amelioration. Today the whole mass rolls under the fingers and is only the size of an almond without its shell. General condition as satisfactory, if not better, than before treatment. To recapitulate:

First, in these cases of tubercular lymphangitis, the action of the X-ray has been distinctly favorable.

Second, it has caused a decrease of all the tumefied glands treated, but rarely their complete disappearance.

Third, the neighboring glands, not treated and protected from the rays, have remained unchanged.

Fourth, the most efficient radiations appear to have been those, which, whether by their quantity or their quality, produced a marked inflammation of the skin.

Fifth, no evil effects from this glandular decrease, sometimes rapid, upon the general condition of the patients were observed.

J. BERGONIE.

Bordeaux, France, April, 1905

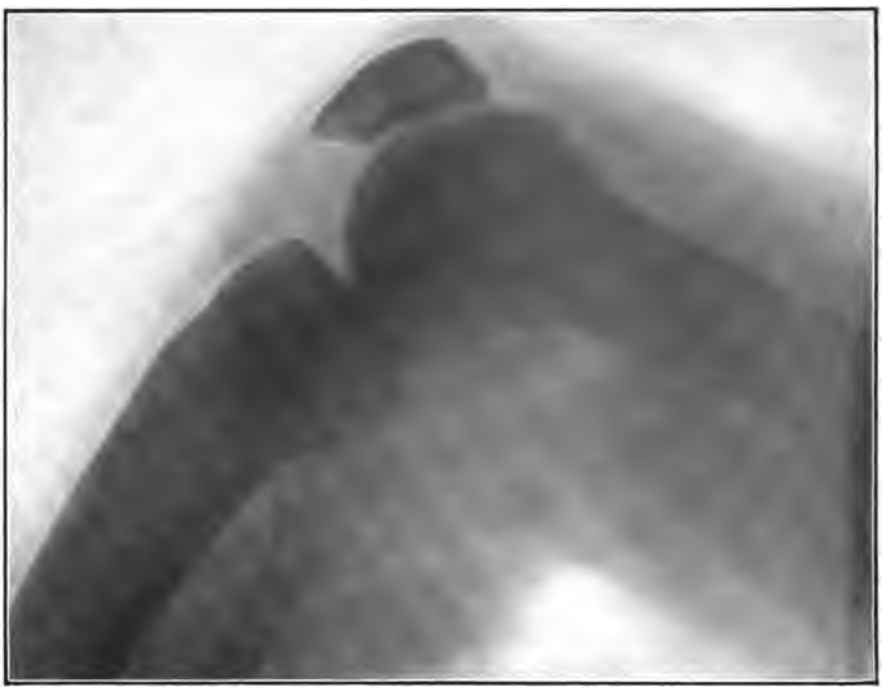
Special Plates Illustrating

Tuberculosis of Knee and Lungs, Arthritis Deformans of Fingers

Tuberculosis of left knee. The case was treated as one of rheumatism for two years before the clinical diagnosis of tuberculosis was made; four months later this skiagraph was taken and five weeks after that amputation was performed. Autopsy upon the amputated joint demonstrated that every structure about it was involved except the articular surfaces, the soft parts being riddled with small sinuses.

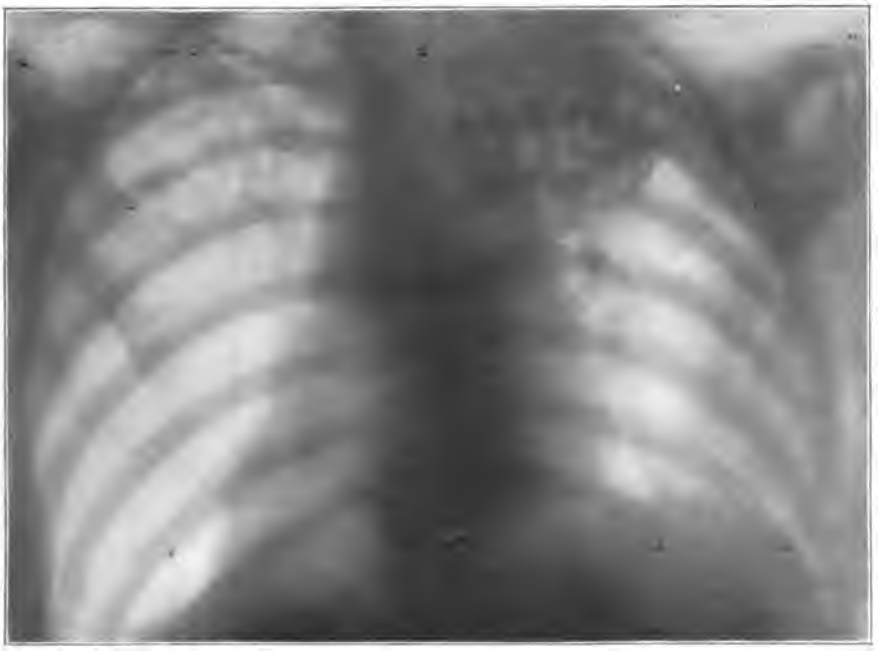
Made with a double anode tube of two inches spark resistance; anode 16 inches from plate; exposure four minutes; exciting apparatus Wagner 8-plate static machine. Seed plate.

By Dr. William Hill Bean, New Haven, Connecticut.



Normal right knee of the patient from whom the preceding plate was made, produced with the same technique and apparatus.

By Dr. William Hill Bean, New Haven, Connecticut.



Tuberculosis of the Apices of both lungs, with cavity 3 in. in diameter in right Apex.

Queen tube; Queen coil; 40 seconds exposure; vibrating interrupter; Cramer X-ray plate; Pyro developer.

By Dr. G. C. Johnston, Pittsburg, Pennsylvania.

Arthritis Deformans of fingers of twenty years' standing.

By Dr. Gordon G. Burdick, Chicago, Illinois.

THE ARCHIVES OF PHYSIOLOGICAL THERAPY

Devoted to the Diagnostic and Therapeutic Uses of Electricity, Radiant Energy, Heat, Water, Mechanical Vibration, Dietary Regulation, Exercise, Psychic Suggestion, etc.

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ELECTRO-THERAPEUTICS IN CHRONIC MALADIES

J. H. KELLOGG, M. D., BATTLE CREEK, MICHIGAN.

I SHALL not attempt in this brief paper to cover the whole ground of electro-therapeutics. I shall confine myself to the medical uses of the galvanic and the sinusoidal currents, which I regard as of much greater value therapeutically than either the static or faradic currents, because capable of more profoundly influencing general metabolism and the functions of individual organs than other forms of electrical energy. The X-ray, the electric light, radium, etc., are not properly included in the domain of electro-therapeutics.

For more than thirty years I have devoted myself to the study of physiologic therapeutics and the practical application of natural and rational measures in the treatment of chronic disease, and have endeavored to correlate into a practical system the various curative forces comprised under the terms hydrotherapy, kinesitherapy or medical gymnastics, active and passive, thermotherapy, phototherapy, and electrotherapy. Each of these classes of curative measures is a complete system and presents resources which may be made available in almost every form of disease, acute and chronic. There is perhaps no disease or morbid condition in which hydrotherapy may not render some substantial service. The same may be said of phototherapy, electrotherapy and all other classes of natural curative agents. Nevertheless, a careful study of each of these classes of therapeutic measures renders clearly apparent the fact that each one has its special province. That is, there is a special class of cases in which hydrotherapy is particularly applicable: for example, in fevers, in chronic maladies in general, especially in various forms of indigestion, neurasthenia and various other nervous disorders, hydrotherapy is perhaps the most useful and effective of all physiological remedies, because of the powerful influence which it exercises upon general metabolism and the marvelous control which may be obtained through its use over the blood-supply and the functional activity of internal as well as external parts. In the

writer's opinion, hydrotherapy is the biggest gun in the physician's armamentarium.

Every other class of physiologic measures has likewise its special province. This is particularly true of electro-therapeutics. There are cases in which electricity will accomplish what cannot be so well and quickly done by any other means. Even in these cases, however, the best results are often attainable only when hydrotherapy and other physiologic means are employed in connection with the application of electricity. For example, when electricity is employed for the relief of pain its effect may be greatly enhanced by making use previously an application of heat, as by means of a very hot fomentation. The fomentation moistens and congests the skin, and thus increases its conductivity while lessening the sensibility of the cutaneous nerves so as to increase their tolerance of the electric current, thus rendering possible the application of a current of maximum strength. Heat has also a specific effect to inhibit pain, thus contributing in a marked degree to the desired result. By this combination of the hydriatic and thermic effects of a fomentation with the special effects of the electrical current, results are often obtainable which cannot be attained with either measure alone. I have for many years practiced the application of heat in connection with electrical applications by placing over the electrode a rubber bag filled with hot water, or a flannel cloth wrung out of hot water.

On the other hand, when it is desired to secure the stimulating effects of electricity, as, when the purpose is to excite muscular contractions, a cold application just preceding the electrical application is of very great value by increasing muscular excitability. Every one is familiar with the fact that cold water is likely to cause cramp in swimmers. This is a very pronounced example of the effect of cold water acting through the thermic nerves in exaggerating muscular contractility, even to the degree of producing spontaneous tonic muscular contraction. The cold application may consist of a compress wrung out of cold water, or rubbing the part with ice. The application should not last more than three or four minutes. It should be accompanied with rubbing. By this means it is possible to secure contraction in muscles which do not respond to an electrical current which the skin will tolerate. I find it especially useful in the application of the sinusoidal current to the abdomen and back for gymnastic purposes. Vigorous cold rubbing is also of great service as a preparation for electrical applications in cases in which muscular degeneration has taken place to such a degree as to lessen susceptibility to electrical stimulation. A long chapter might be written on the correlation of electro-therapy with hydrotherapy, but the special purpose of this paper is to call attention to a few practical points in connection with the application of the galvanic and sinusoidal currents.

In relation to galvanism, I desire especially to emphasize the necessity for using currents large in amount or of long duration. Thirty years ago I worked for some months with Dr. George M. Beard, who then stood foremost in this country in electro-therapeutics, and since that time, have made very extensive use of electricity in the treatment of chronic invalids, having had constantly under my supervision from two hundred to seven hundred chronic invalids, nearly all of whom have received daily applications of electricity in some form. For years I have made personally scores of applications daily, and carefully studied the effects. I was not very long in recognizing the correctness of the suggestion made to me by Dr. Beard as I was leaving him. He said, "Doctor, if you expect to get definite results from electrical applications, you must be sure that your patient has faith; otherwise the

application will do him no good."

The introduction of the milliamperemeter and other instruments of precision into practical electro-therapeutics made possible the employment of current in larger quantity, so that results more tangible than mere psychological effects became possible. Some sixteen years ago I became convinced of the necessity of using currents of larger volume and longer duration, and I immediately began to see results such as I had not before observed. For example, applying one large, well-moistened electrode over the abdomen, and the other, the positive, to the back of the neck, and applying a current of forty to sixty milliamperes, I have observed in four or five minutes evidence of very great increase of glandular activity in the fact that patients were compelled to use their handkerchiefs freely on account of the profuse flow of saliva. I thought it reasonable to suppose that other glands within the sphere of action of the current were likewise influenced. Observations which I have subsequently made have convinced me that the activity of the gastric and intestinal glands and the glands of the kidneys may be powerfully influenced by strong galvanic currents passed directly through the body. For many years it has been my practice to apply daily in cases in which I wished to influence the abdominal viscera currents of forty to one hundred milliamperes by means of large clay electrodes, placed over the abdomen and the lumbar region. I have seen most excellent results from galvanic applications of this sort. I would not like to dispense with this means of treatment in dealing with gastro-intestinal disorders, and in cases of malnutrition accompanied by emaciation. I have also found it useful in various forms of visceral congestions and neuralgias.

I have found no inconvenience from the application of these large currents when proper electrodes were used. If the electrodes are too small, or are not made of proper material, so that intimate contact is not secured, small blisters may form, or a diffuse redness and soreness. This is wholly obviated by using large clay electrodes, pads made of gelatin mixed with white lead or red lead, or some other form of electrode securing equally good contact.

About twenty years ago I conceived the idea of applying electrical currents of smaller quantity during a prolonged period, as one to ten hours. A convenient method is to make the application at night, binding the electrode to the affected part and allowing the current to pass during the entire night while the patient is asleep. In a building lighted by electricity this is easily arranged, by employing some simple form of rheostat, taking the current from a lamp socket. The rheostat must be constructed so that it can not be easily disturbed, so that when it is once adjusted, the amount of current can not be increased. Four to ten milliamperes, the quantity differing with the size of the electrode, may be applied by this method during a whole night without any ill effects, and often with most excellent results.

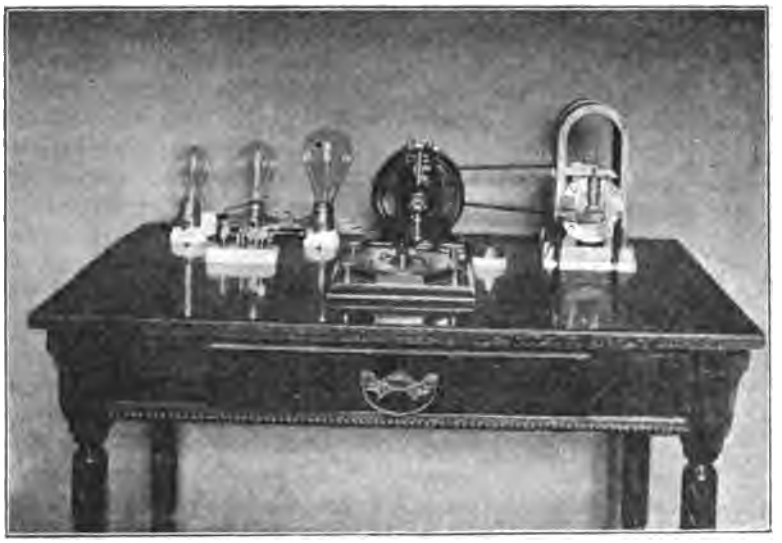
The idea of making a prolonged application of electricity is by no means new, as it has been exploited by quacks and charlatans to an unlimited extent in the form of electric belts, electric armor, etc. My undertaking was to make an application of a known quantity of the current during a definite but prolonged period and with a definite purpose. I have found the result so valuable that, in equipping the new main building of the Battle Creek Sanitarium I took care to have an extra socket in each room as a provision for utilizing the house current in this way. I believe that much more may be accomplished by this mode of electrization than has heretofore been realized, especially in the use of the galvanic current. I am preparing a more extended

account of my observations with this method for publication in another paper.

Some twenty-one years ago in experimenting with all the different forms of electrical apparatus which I could obtain, and electrical currents obtained from different sources by different methods, I made use of a simple magneto-generator at that time used for ringing of bells of telephone systems. I was much impressed with the fact that this generator, when operated slowly, produced exceedingly energetic muscular contractions, and without painful sensations unless the contractions became so violent as to be painful. When rotated very rapidly the current produced was so strong that I was not able to control it by any rheostat at that time obtainable. I accordingly constructed a water-rheostat, using for the purpose a small glass tube about three feet in length. Using a water-motor to operate the machine, and this simple rheostat for controlling it, I made many thousands of applications.

I first described the effects of this current in a paper read before the American Medical Association in 1888. Four years later, some nine years after I discovered the peculiarities of this current, d'Arsonval of Paris, presented, at a conference of the French Society of Physics, a paper in which he described the effects of an electrical current to which he applied the term "sinusoidal." He obtained this current from a small magneto-electric machine modeled after the machine of Clarke. I saw at once that the current which he had studied was identical with the one of which I had been making use for several years, and with the aid of my electrician, I constructed an electrograph by means of which I was able to make graphics which agreed exactly with those of d'Arsonval. These graphics with others obtained from different forms of electrical apparatus may be seen in connection with a chapter contributed by me to the "International System of Electro-therapeutics" (F. A. Davis Company, Philadelphia). I found that all magneto-generators gave the sinusoidal current, but that the smoothness of the current might be improved by a modification of the pole-piece and armature. I also found some advantage in substituting an electro-magnet for the permanent magnets commonly used in magneto-electric machines, as this gave more perfect control of the current. These modifications Dr. Jacoby has briefly described in the first book of his "Electrotherapy," constituting Vol. 1 of "Cohen's System of Physiologic Therapeutics" (P. Blakiston's Son & Co., Philadelphia). Dr. A. E. Kennelly later designed an excellent alternator for producing sinusoidal currents of high potential which could not be improved upon.

In my own use of the apparatus I found the current produced by slowly rotating the armature of the machine of fully as great value as that produced by rapid alternations. What I desired was to obtain a machine capable of producing strong muscular contractions when rotated slowly so as to produce alternations at the rate of ten to twenty a second, while producing when rotated at the rate of three or four thousand turns a minute a current which could be perfectly controlled by an ordinary rheostat. For a long time I worked with two rheostats in circuit. The apparatus provided with an electro-magnet was more easily controllable but more costly and complicated. I have made many different forms of apparatus which I will not take time to describe. After all my experiments, many of which were rather expensive, I have arrived at the conclusion that for practical purposes the ordinary power generator, such as I have here on exhibition, is, on the whole, perfectly satisfactory. The current produced is sinusoidal though the curve



is not perfectly regular, but in practical use I have not been able to see any essential difference between the effects obtained from it and those obtained from a machine producing a more uniform curve. The apparatus is well made and is durable, as I have demonstrated by several years of hard usage, and is of low price. The retail price of the generator is, I believe, about $9. They can be obtained from almost any telephone supply house. The current from this machine may be easily controlled by an ordinary graphite rheostat. Both the slow and the rapid currents obtained from this machine are perfectly satisfactory. As ordinarily used, the machine is operated by a crank and pinion, but a pulley may be substituted for the crank and gearing, so that a small electric or water motor may be used as the motive power. For complete control and regulation a friction brake must be connected with the generator. The total expense for an apparatus of this sort, including motor, need not exceed $25.

In a paper read eleven years ago at the third annual meeting of the American Electro-therapeutic Association, I described the effects of the slow and rapid currents obtained from this apparatus as follows:

"In the use of the sinusoidal current from my apparatus different effects are observed, according as the machine is rotated slowly or at a high rate of speed. When rotated slowly and connected with sponge electrodes held one in each hand, vigorous contractions are produced in each arm, and in alternation nearly all the muscles of the arm seeming to participate in the contractions. When one electrode is placed in contact with the feet and the other held between the two hands, the muscles of both extremities are made to contract vigorously. The contraction is spasmodic rather than tetanic in character, as when the faradic current is employed. By proper adjustment of the current strong muscular contractions may be induced without producing the slightest sensation on the skin, and without any pain sensation whatever. With one electrode placed in the rectum or the vagina, and the other upon the abdomen, strong contractions of the abdominal muscles may be produced, and even of the muscles of the upper thigh without any sensation other than that of mo-

tion. I have frequently seen patients while receiving the current in this manner shaking so vigorously under its influence that the office table was made to tremble quite violently with the movement.

"With the rapid rotation of the machine, the current obtained is capable of producing strong tetanic contractions similar to those induced by the faradic machine. The only skin sensation produced by an application sufficiently strong to induce tetanic contractions is a slight prickling, but far less intense than that produced by a faradic current capable of exciting equally strong motor effects.

"The sensory effects produced by the current are exceedingly interesting. As has been already stated, applications of the current sufficiently strong to produce vigorous muscular contraction are attended by no sensory effects whatever. The sensory effects are best obtained by giving the machine a high velocity. Adjusting the apparatus for high velocity, and applying the sponge electrodes, well moistened, to the temples with a gradually increasing current, and with the eyes closed, one seems to see rotating waves of light, resembling a luminous whirlpool in the region of each electrode. It is a curious fact that the position of this luminous field is not stationary; it moves with the electrode, which seems to be the center of the illuminated area. As the current is increased in strength, the display of light increases in brilliancy, finally becoming so extended and intense that the whole front portion of the head seems to be brightly illuminated. At this point one begins to experience very slight prickling sensations in the skin, which increase as the intensity of the current increases. A remarkable characteristic of the current is, that strong impressions are made upon the optic nerves, or their centers, by a current too delicate to be recognized by the nerves of the skin. This effect must be due to the great penetrability of the current.

"Duchenne showed, in his masterly work published during the siege of Paris, that there is a decided difference in the physiological properties of the currents obtained from the first and the second helix of an induction apparatus, and that these currents have very different clinical applications. The current of the second helix was found to possess much greater penetrating power than that of this first helix. The currents of the two helices differed, according to Duchenne, just 'as water that is warm differs from water that is boiling, or as iron slightly warm differs from iron that is white hot,' as regards their influence upon sensibility. This fact is only cited as an analogous observation, since the sinusoidal current possesses properties very different from those of any faradic current with which I have experimented."

During the eleven years that have passed since this paper was written, I have continued, as during the ten years previous, the use of both the slow and the rapid currents, and with increasing confidence in their value. The rapid current I have also used in connection with the full bath, the so-called hydro-electric bath. The slow current, which in making prescriptions I designate as S. S. (slow sinusoidal), I find exceedingly valuable as a means of exercising weak, undeveloped, or partially degenerated muscles. A great share of chronic invalids have extremely weak muscles and recovery is impossible without proper development of the muscular system. Sometimes exercise is impossible because of the extreme degree of muscular weakness. In other cases exercise can not be taken because of the weak condition of the patient's nervous system. Voluntary exercise requires the use of nerve centers and nerves as well as of muscles. In certain forms of neurasthenia, great exhaustion results from even slight muscular exertion. In such

cases the sinusoidal current employed as a means of general muscular exercise, is of the highest value. The application is painless to the patient, requires no expenditure of muscle or nervous energy, and the patient's muscular system can be made to do a tremendous amount of work in a very short time. One extremely interesting peculiarity of the slow current is the large number of muscles which can be thrown into action at one time. For example, with the electrodes applied to the feet, all the muscles of both legs may be thrown into vigorous action; or with one electrode applied to the foot and the other to a motor point at the upper part of the thigh, all the muscles of the leg may be thrown into vigorous action. With one electrode held in each hand, the arm muscles may be excited. With one electrode placed at the upper part of the back and the other across the sacrum, the muscles of the back may be powerfully excited. With one electrode on either side of the abdomen, the abdominal muscles may be made to contract so vigorously as to shake the table on which the patient lies, and without any other sensation than that of motion. It is thus possible to throw into vigorous action all the principal groups of the body in a short time, and with a few applications of the electrode. An application of this sort I designate in prescription writing G. S. S. (general slow sinusoidal).

A simple calculation will give something of an idea of the large amount of work which the muscles can be made to do in a short time by this method. With a current alternating five times a second, ten strong muscular contractions can be produced each second, as the muscle contracts with each alternation of the current. There will be six hundred contractions each minute, and in ten minutes six thousand contractions. One or four minutes' application to any part of the muscular system is usually sufficient to secure the required amount of work. That the contractions produced are energetic may easily be demonstrated by undertaking to hold a part which is contracting under the influence of the current. If, for example, a strong man takes hold of the foot of a person whose posterior tibial muscles are being stimulated by the current, he finds it utterly impossible, using all his strength, to hold the limb still, or even materially to limit the movement of the foot. The vigor of the application may be increased to any desired extent by directing the patient to voluntarily render his muscles rigid while the current is being applied. For the best effect, the electrode should be applied to recognized motor points; but excellent results are obtainable by the application of the electrode along the edges of muscular groups. It is certainly not necessary to give so much attention to motor points in the use of this current as in the use of galvanic or faradic currents, as the current has enormous penetrating power.

The slow sinusoidal current is also of very great use in the treatment of obesity. In fact, I find it almost indispensable in the treatment of patients who have become so obese that they can not exercise, or who have cardiac complications making any considerable amount of exercise impossible. Massage is of some use in such cases, but it can not take the place of active exercise of the muscles. The sinusoidal current, however, will do this, and in a most effective way. By prolonged applications, repeated two or three times daily, the patient's muscles can be made to do as much work as though he had walked several miles. Very strong currents are required, and the patient must be willing to endure some inconvenience, as very vigorous contraction continued during a considerable period are necessary to produce effects akin to those of voluntary exercise. Local applications of the sinusoidal current are of very great

value as a means of removing local accumulations of fat.

Another important use which I find for the slow sinusoidal current is in the treatment of spinal curvature due to muscular weakness, especially lateral curvature, single and double scoliosis, also in those cases of posterior curvature of the upper portion of the spine, commonly called round shoulders or flat chest. Cases of this sort are always curable when the patient's muscles can be made to contract either voluntarily, or by the aid of the electrical current in such a way as to correct the curvature, and some cases are curable even when the patient's efforts must be supplemented by gentle mechanical means. In these cases, the sinusoidal current may be applied in such a way as to bring in vigorous contraction either all the muscles of the back, or the particular groups which especially require strengthening.

Another indication for the sinusoidal current, which I regard as extremely important, and in which both the slow current and the rapid current may be advantageously employed, is in the treatment of enteroptosis, a malady which is almost universal among American women, and extremely common among business and professional men. Since Glenard called attention to the significance of this condition, the great evils which arise from prolapse of the abdominal viscera through irritation of the sympathetic nerves as well as derangement of the functions of individual viscera, I have given much attention to this matter, carefully noting the position of the viscera in every case; and, after observing many thousands of cases of chronic disease in all forms, I am compelled to say that weakness of the abdominal muscles and resulting displacement of viscera is a prevailing condition among chronic invalids. It is rare indeed to find among women a person over twenty years of age whose viscera are not more or less displaced. The primary causes of this condition are, weakness of the muscles of the trunk, the stooped position assumed in sitting, which is compelled by the ordinary chair which necessarily relaxes the muscles of the trunk; and thus the continuous pull of gravitation is allowed to drag the heavy viscera which lie across the upper portion of the abdominal cavity downward little by little, until they may be several inches below the normal positions. I encountered a few days ago a liver lying in the right iliac fossa. In this patient the abdominal muscles were weak and flaccid to the last degree. The various viscera, even the intestines, the aorta, and the iliac arteries, could all be distinctly felt through the attentuated abdominal wall, which seemed to consist of almost nothing more than skin and fascia.

I have employed the slow sinusoidal current in the treatment of several thousands of such cases, and, with such excellent results that patients who were at first unable, when lying down, to raise one leg a few inches, have been able to easily raise both legs to the perpendicular without inconvenience, to sit erect, and to walk for miles with a strong elastic step, though previously scarcely able to drag themselves for a few rods without sitting down to rest. There is no method I know of as a means of strengthening the abdominal muscles in extreme cases so valuable as the slow sinusoidal current. The slow sinusoidal current is, of course, an exceedingly appropriate measure for exercising any part of the body which needs special development.

The work accomplished under the influence of the sinusoidal current is not merely mechanical. The effect is entirely different from that of mere passive movement. A simple experiment will easily demonstrate this. If the temperature of the skin covering the calves of the legs be taken for each leg by means of a surface thermometer, and

then a sinusoidal current be applied for a few minutes to the motor point controlling the posterior tibial muscles of one leg so as to throw them into vigorous intermittent contraction, a marked difference of temperature will be observed. In an experiment conducted for me by one of my students, the temperature of the active leg was observed to rise 3.2° F. in ten minutes. The elevation of temperature must have been the result of the increased amount of blood flowing through the part, and of thermogenic activity in the active muscles. By extending the application to all the fifty larger groups of muscles in the body, effects may be produced capable of influencing all the bodily functions to a most pronounced degree. The most important of these effects may be briefly summed up as follows:

(1) *Increase of Metabolism.* The muscles are the principal seat of the thermogenic process. Associated with the muscular tissue is a large amount of thermogenic tissue, so-called. In the muscles are stored up large quantities of glycogen. Oxidation of this thermogenic tissue is constantly taking place under the influence of the thermogenic centers. The amount of oxidation which takes place is largely determined by the amount of blood circulating through the muscle; the more blood, the more oxidation, for the reason that the blood brings oxygen which consumes the tissue, and also because of the stimulating effect of the heat which the blood brings, and of the effect it has upon the thermogenic nerves and the whole thermogenic process. As Bouchard and others have shown, a large share of all chronic maladies are due to a slowing of the metabolic processes — *relentissement de nutrition.* The most important thing to be accomplished in the treatment of these cases is an acceleration of nutrition. The great value of exercise, cold baths, hot baths and other hydriatic measures consists in their power to increase metabolic activity. There could be no increase of constructive activity without a preliminary acceleration of metabolism. An eminent physiologist describes man as a form through which a stream of matter flows. The grade of life and vitality depends on the rate at which the vital stream moves. Anything which stimulates metabolism, accelerates the vital current. The sinusoidal current accomplishes this in a way no other current does, when applied in an effective manner. Simple brushing of an electrode over the skin with an electrical current of some sort which produces a slight tickling or prickling sensation, accomplishes practically nothing for the patient. Physicians as well as patients become disgusted with the inefficiency of such electrical applications, and rightfully come to look upon them as a means of appealing to the patient's imagination, or, possibly, simply a method to replenish a hungry pocketbook. Multitudes of physicians have spent considerable sums of money in supplying their offices with electrical apparatus which they have ceased to use within a few weeks after installation, simply because of the barrenness of the results and of their inability to see a rational basis for the applications made.

The sinusoidal current rests upon a solid foundation of positive effectiveness. Its influence upon metabolism may be accurately measured. A simple bathtub calorimeter affords a simple means of determining the amount of increase of tissue activity produced under the influence of the current. The amount of heat generated by a person in a bath at a temperature below his body may be measured by noting the amount of heat communicated to the water. For example, if a person is placed in a bath of four hundred pounds of water and the water rises half a degree in temperature within fifteen minutes, the meaning is that the patient has produced and com-

municated to the water two hundred British thermal units in the time noted. This would be about double the ordinary rate of heat production. This is what one would expect in a cold bath, as cold increases heat production. If, now, the sinusoidal current is applied to the patient while in the bath in such a way as to cause contraction of all the larger groups of muscles in the body, an increase of heat production ought to be manifested by an increased rate of temperature rise in the water. Of course, the usual precautions necessary in a bathtub calorimeter must be employed, as noting the room temperature; the rate at which the bath is cooling when the subject enters it, etc.

A subject placed in the calorimeter for twenty minutes communicated to the water of the calorimeter forty-six calories. The sinusoidal current was then turned on with sufficient strength to produce general contraction of the muscles. At the end of another twenty minutes it was found that sixty-one calories had been added to the water, showing that an increase of fifteen calories had occurred; that is, it was found that the patient had produced 32 per cent. more heat. The increase in heat production was at once appreciated by the subject by a relief from chilliness from which he had previously suffered very much. As long as the sinusoidal current was passing, he felt perfectly comfortable, and stated that he could remain in the water for an hour or two without discomfort. Severe shivering which existed before the application of the sinusoidal current and had become very painful and distressing to the patient, disappeared entirely within a minute or two after the current was turned on. This fact is of considerable advantage, as it permits the application of a water bath at a lower temperature than can be tolerated without the current, and hence enhances the tonic effect which may be obtained.

From this it appears that the sinusoidal current produced an increase of heat production amounting to one-third. There can be no question whatever that the sinusoidal current has a powerful influence upon metabolism. The combined effect, that is, the thermic influence of the water — the temperature of the bath was 86° F. — and that of the sinusoidal current, increased the heat production from the normal rate, 1.8 calories per minute, to 3.05 calories, nearly double the normal rate. At this rate a bath of thirty minutes' duration would consume an ounce of sugar. If a patient, then, is found to have sixty grams of sugar in his urine, one might expect to consume the greater part of it by a sinusoidal bath of thirty minutes' duration twice a day; and this, I find in actual practice, can be done. It is a common thing in the practice of the physicians at the Battle Creek Sanitarium to see the sugar reduced from seventy-five or one hundred grams to a few grams, or even a fraction of a gram, as the result of a few weeks' treatment in which the sinusoidal current plays an important part.

(2) *Increase of the Peripheral Circulation.* There are few chronic diseases in which visceral congestion is not an important part. The pale or sallow skin of the chronic dyspeptic is a plain indication of a spasm which exists in the peripheral vessels, and as a necessary consequence, visceral congestion. Hemorrhoids and other forms of rectal disease which are so common among chronic invalids are another indication of portal or visceral congestion. An active muscle contains several times as much blood as an idle muscle. The skin and the muscles together are capable of holding all the blood in the body. When, by the application of the sinusoidal current, the muscles are thrown into vigorous activity, the vessels dilate, and the amount of blood circulating through the muscles and the overlying

skin, is increased several hundred per cent. The natural result of this increased activity in the peripheral circulation, and dilatation of the surface vessels, is the withdrawal of a large amount of blood from the vessels of the viscera. Congestion of the nerve centers, congestion of the liver and stomach, intestines, kidneys, lungs, and other internal parts may thus be quickly and positively relieved. The effects of the sinusoidal current, unlike those of exercise, of a warm bath, or of massage, are obtained without any exertion whatever on the part of the patient; hence without the fatigue and nervous exhaustion, which, in many cases, inevitably result from even the mildest application of the procedures named. There is no other method with which the writer is acquainted by which visceral congestion can be so promptly and certainly relieved with so little expense to the patient as by the application of the sinusoidal current. The patient is made to appreciate at once the favorable effect by relief from backache, headache, sideache, and the various indescribable distresses which are the common expression of visceral congestion.

The application of the sinusoidal current to the abdomen alone is sufficient to produce great relief in a large class of neurasthenics who suffer from a great variety of distressing symptoms as the result of congestion of the portal system and consequent irritation of the sympathetic centers. In the writer's opinion, the majority of neurasthenics are suffering from this cause. Neurasthenia must be looked upon not as a disease but as a symptom. The writer was acting as assistant to Dr. George M. Beard in the department of nervous diseases in the Demilt Dispensary, New York City, taking careful records of patients at the time when this lamented genius was collecting the data which he later published in his work on neurasthenia, and during the years which have elapsed has had opportunity for observation of a great number of neurasthenics. Careful study and consideration of the subject long ago led to the fixed belief that neurasthenia can not be in any proper sense regarded as a disease, but only as a symptom, like dropsy, albuminuria, glycosuria, cough, anemia, and other similar pathological states. The pathological foundation of neurasthenia differs in different cases, but in a large proportion of cases it is unquestionably located in the abdominal region and consists in a disturbance of the sympathetic growing out of passive congestion or stagnation of the portal circulation. This is in probably the majority of cases the result of reduced abdominal tension, which is, in turn, the result of weak abdominal muscles. Nature often undertakes to compensate for this muscular weakness by pouring out into the intestines an enormous quantity of carbonic acid gas which accounts for the extreme flatulence from which these patients often complain. Much relief is obtained by the application of an abdominal supporter. A man told me he had been going around three years with his hand in his pocket to hold his belly up. Permanent relief is obtained only by development of the abdominal muscles, thus restoring the intra-abdominal tension which, by compression of the portal vessels and the viscera, relieves them of their surplus blood, and thus relieves the irritation of the sympathetic centers which produces depression, insomnia, irritability, backache, headache, and the infinite variety of distressing symptoms known only to neurasthenics. Weakness of the abdominal muscles necessarily means weakness of the diaphragm, for the abdominal muscles are the opposing muscles of the diaphragm. With a weak diaphragm and weak abdominal muscles, the viscera and abdominal vessels must necessarily be over-distended with blood, and the result is functional and organic disturb-

ances, a great variety of which may be mentioned: Hyperpepsia, ending later, when the gastric glands are exhausted, in hypopepsia, apepsia, and possibly cancer of the stomach; gastric ulcer, gastralgia, gastric catarrh, gastric dilatation; biliousness, intestinal catarrh, pseudomembranous colitis, constipation; gallstones, cholecystitis, hepatic cirrhosis; movable and floating kidney, floating liver, gastric and intestinal prolapsus, and a multitude of disorders growing out of those mentioned are the result of the relaxed condition of the abdominal muscles almost universally found in chronic invalids of all classes. To those mentioned may be added a large share of the pelvic disorders from which women suffer, possibly also prostatic disease, which is almost as common in men of sedentary habits as uterine disease in women.

By the application of the slow sinusoidal current to the abdomen vigorous intermittent contractions of the abdominal muscles may be produced, and as a result their tone may be increased so that through compression of the abdominal veins the stagnated blood is pushed along; the half-asphyxiated viscera are cleared of their toxin-laden blood; the sympathetic centers receive a fresh, invigorating blood-supply; the diaphragm is strengthened, and hence the breathing is reinforced, the blood better aerated; the heart's action is invigorated; metabolism is encouraged, and every vital process is improved. Aside from breathing exercises and special exercises which develop the abdominal muscles, there is no one thing which is capable of affording so much relief in a large class of neurasthenics, especially neurasthenic women, as the sinusoidal current properly applied to the abdominal muscles. Both the slow and the rapid current should be employed, the slow current as a gymnastic exercise for the muscles, and the rapid current for relief of sympathetic irritation and visceral pain which exists in a large proportion of these cases.

The rapidly alternating sinusoidal current which I designate in prescription as S. R. (rapid sinusoidal) is applicable in neuralgia in all parts of the body. It is of great value in relieving coccygodynia, spinal and intercostal neuralgias, and particularly the paresthesias from which neurasthenics and other classes of nervous invalids often suffer to a distressing extent.

I have employed the rapid sinusoidal current for twenty years with most satisfactory results in cases of so-called ovarian irritation, ovarian neuralgia, uterine inflammation, and other forms of pelvic disease. I have found it especially effective in relieving the aggravating pain which proves often so persistent after abdominal section for removal of the uterine appendages and ovarian or uterine tumors. I found the slow sinusoidal current very useful in the development of the abdominal muscles after the operation for shortening the round ligaments, so as to insure the patient against the return of the retrodisplacement for relief of which the operation was performed.

Since becoming acquainted with the sinusoidal current, I have found little use for the faradic current, which is painful and, while possessing no special merits to recommend it, is inferior in every way to the rapid sinusoidal current as a curative agent.

I make very large use of static electricity, and I am studying the effect of the high-frequency current. These are sinusoidal currents of peculiar character, but I believe of far more limited application than the sinusoidal current obtained from the magneto-electric apparatus.

In concluding this paper, I wish to put myself on record as believing that much of the prejudice against electrotherapeutics is due to the fact that electricity is so often exploited as a cure-all. Most of the works on electro-thera-

peutics which have been published recommend this agent for almost every malady flesh is heir to. This is certainly an error. Electricity properly applied is capable of accomplishing wonderful things therapeutically, both when applied exclusively to conditions in which it is specially adapted, and in conjunction with other measures, in conditions in which it is a useful supplementary remedy. The great merit of electricity as a curative agent lies in the fact that it is a physiologic remedy. As such it belongs to a family of noble remedies which are in recent times rapidly coming into better recognition, remedies which utilize the great forces of nature, those which are active in the production and maintenance of living beings. None of these great natural agents, heat, light, electricity, etc., should be employed exclusively. The proper correlation of these physiologic agents in such a way as to give to the sick man the best possible chance for the recovery of health constitutes the true art and science of rational therapeutics.

THE HIGH FREQUENCY CURRENT AND THE X-RAY IN PULMONARY TUBERCULOSIS

BY O. SHEPARD BARNUM, M.D., OF LOS ANGELES, CALIFORNIA

I am aware that many operators in this country have been using the newer forms of electrical treatment for phthisis and in most instances of which I have been informed the results have been quite successful. The great need seems to be confidence enough to allow the treatment to be given exclusively, in order that reliable data may be evolved for comparison and future guidance. Possibly my location in the "Mecca" for tubercular patients has given me special opportunity for research in this line; at any rate I offer this article as a contribution to the general subject, hoping that it may prove suggestive to some and enable me by discussion to learn wherein my method may be improved.

I hold that no haphazard deductions from clinical experience should be given a hearing by the profession, and so my efforts on the cases here reported and to be reported, have been given assiduously to placing the reports on a scientific basis worthy of a hearing by a body of discriminating electro-medical scientists. The cases I here cite are typical of all I have had and who are now under my care, there being no exceptions whatever to the general progress of the cases during treatments.

Case 1 — Mr. B., æt. 37, present weight 112, normal weight 140.

Family History. — Tuberculosis on mother's side; parents living at advanced age.

Seven years ago pulmonary hæmorrhage; came to California four years ago and was comparatively well for a time; in February, 1904, began to cough and fail very rapidly; in two weeks preceding July 9, lost six pounds; heart erratic; bowels and appetite fairly good; has night sweats and all the concomita of acute tuberculosis.

Physical Examination. — No complications; bacilli abundant; lungs showing characteristic spots of infiltration.

Began treatment July 9.

Aug. 6, bacilli plentiful; urinalysis negative.

Aug. 10, improving; lost only one pound in three weeks' treatment.

Aug. 13, holding his own in weight; feels greatly improved in every way.

Sept. 10, improving slowly, bacilli decidedly reduced in number.

Oct. 11, reports gain in flesh and general vitality; greatly improved.

Improvement continued until Nov. 16th, when an attack of acute gastritis from indiscretion in eating killed him.

Case 2.—Mr. F., æt. 43, weight 147. (Radiograph I.)

Family History.—Father's side good, mother died of tuberculosis.

Physical Examination.—Abscess surrounded by consolidation in apex of left lung; rales throughout both lungs; heart enlarged; urine about normal.

Microscopical.—Bacilli in abundance.

La Grippe eleven years ago; when about twenty had hæmorrhage and had cough and expectoration ever since; night sweats for years; slight bloody expectoration at times during past year; too weak to work, but able to get around; appetite fair; heart feeble; bowels troublesome.

Began treatment Jan. 25, 1904.

Feb. 22, gained three pounds.

March 12, few bacilli present; gained five and one-half pounds.

March 26, reports slight hæmorrhage.

April 7, bacilli very hard to find.

May 31, no bacilli found.

June 9, hæmorrhage report, tinge of blood for five days.

July 2, hæmorrhage reported, not severe.

Physical examination shows clearing up of left lung.

July 26, doing some work; gaining strength.

Improvements continued until Feb. 22, 1905, when a severe congestion of the lungs resulted from exposure and disease assumed the active form. Bacilli appeared again and daily temperature for one month ranged from 97.2° to 102.4° F. By April 10, however, he was again in good form, bacilli scarce, and he is once more on the high road to full recovery.

Case 3.—Mr. McF., æt. 34, present weight 122, normal weight 140.

Physical Examination.—Rales through upper parts of both lungs; some bronchophony; respiration 30; pulse 100; temperature 99.4-5° F.

Microscopical.—Tubercle bacilli abundant.

Urinalysis.—Sp. gr. 1022, albuminous; contains pus cells, hyaline and light granular casts.

Began treatment Dec. 7, 1903.

Dec. 22, appetite better; gained three pounds.

Jan. 22, sputum plentiful and thick; bacilli reduced in number.

Feb. 29, reports feeling much stronger and better.

March 21, no bacilli to be found.

April 22, few bacilli found, but attenuated.

June 6, no bacilli; better in every particular; working some.

June 30, working most of the time; no bacilli.

Aug. 29, stronger and better; weighs more and feels better than in years; working at his trade of painter.

Has ceased treatment and is symptomatically cured.

Case 4.—Mr. B., æt. 39.

Has been sick twelve years. Traveled to all foreign resorts and put fortune into consultations and treatments. Takes good care of himself.

Physical Examination.—Left lung completely gone; rales in upper lobe of right (radiograph 2).

Microscopical.—Abundant tubercle bacilli.

Began treatment Oct. 15, 1903.

Nov. 16, greatly increased expectoration for past three weeks; sputum gangrenous.

Dec. 1, expectoration still above nor-

Figure 1

Roentgenogram of Case 2 showing mottled lungs.

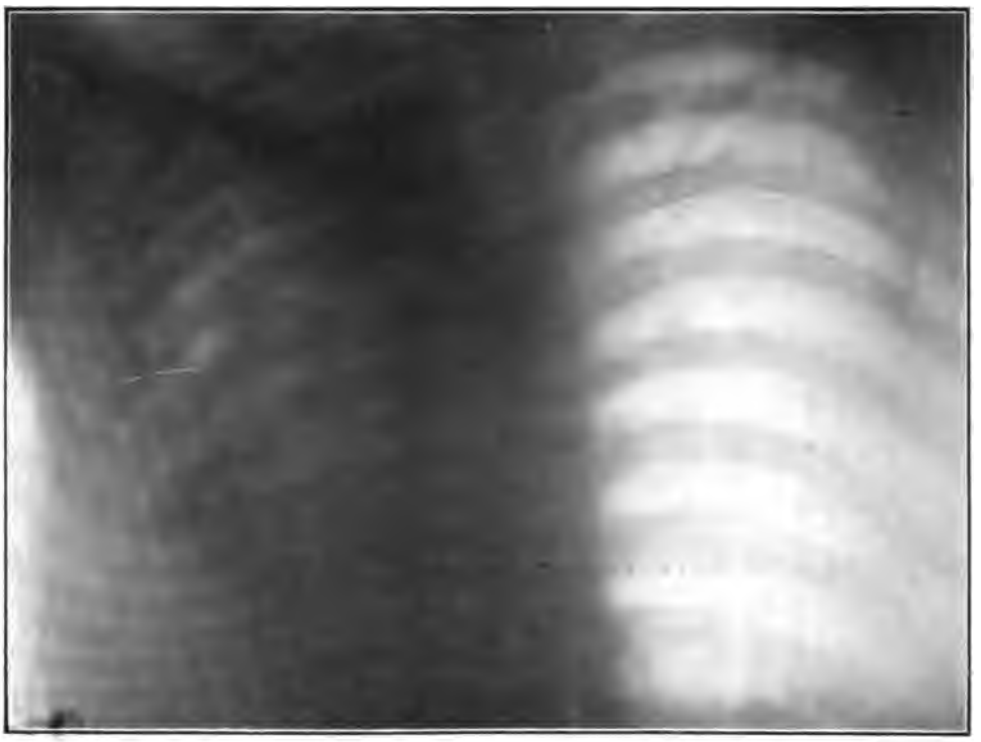


Figure 2

Roentgenogram of Case 4 showing third stage of tuberculosis, complete absence of one lung, and involvement of the other.

mal in quantity, but not so dark.

Dec. 17, tubercle bacilli large, abundant, and very virulent.

Jan. 1, no change in weight since beginning treatment.

Jan. 21, bacilli less in number.

March 2, gained two pounds in past forty days.

March 8, appetite better; sleeps well.

March 18, few bacilli to be found.

April 15, has gained six pounds in six months.

June 3, feels good; gaining steadily.

Oct. 11, bacilli present on some slides, but very hard to find. Still gaining, though business cares have been extra heavy.

Still under treatment, and says he is better than at any time in past eight years. He attends to many business interests and gets about freely and comfortably. Examination of sputum is made semi-monthly and bacilli are still occasionally found, though they are apparently inactive. His temperature is continually subnormal, never going above 98.3° F., except after some unusual exertion. His digestion is excellent and he is slowly but steadily gaining in weight. Expectoration is considable and I expect will continue so for several months more.

Case 5.—Mr. M., æt. 35, Irish, unmarried.

Report not complete but so typical of all the other cases for two months of treatment that it is worth recording as corroboration.

Always well till seven years ago; cold and cough ever since; expectoration yellow and tinged with blood.

Weight 112 pounds, 20 pounds below normal; appetite poor, constipated.

Family History negative. Drinker till three years ago; skin eruption on legs, probably syphilitic.

Physical Examination.—Moist rales over both lungs; more on left side.

Radiograph shows distinct mottling.

Temperature subnormal, pulse 100. Urine negative.

Began treatment Feb. 11, 1904.

Feb. 20, some depression reported; expectoration more abundant.

Feb. 25, better and stronger.

March 12, feels stronger and encouraged.

On acount of his poverty and unsanitary surroundings I urged him to go to the County Hospital, where I lost track of him.

The inhibitive effect of the X-ray on tubercular activity, which has been manifest for years in patients under my care, led me to combine the X-ray with high frequency in all phthisical cases, and I believe its value is considerable as an adjunct to the other modalities. I administer the X-ray once weekly with a tube of deep penetration for five to fifteen minutes posteriorly at a distance of 20 inches. The effect of this treatment is chiefly appreciable by increase in the amount of expectoration; the invariable report of the patient on the following day being "sense of physical depression, looser cough, and greatly increased amount of sputum."

In one case this increase amounted to eight times what was usual, and was decidedly gangrenous in appearance after but one treatment. These symptoms continue about two weeks, or possibly three, after which improvement in all these particulars is noted, accompanied by better sleep, appetite and bowel function.

I administer the high frequency twice or thrice weekly as may be advisable for the entire time the patient is under my care. The treatment consists of a 20-minute rest in a reclining chair or couch which is in circuit with the machine, and is without sensation of any kind whatever; patients frequently go to sleep during the séance. Its effects are an immediate rise of temperature of at least one degree within the time of sitting, and a "feeling of lightness," as it is generally termed by the patients, which is in real-

ity a very slight exhilaration, remaining appreciable during the subsequent forty-eight to seventy-two hours. At the end of a month the improvement is sufficient to give renewed hope and courage to the patient, and from then on the gain is usually steady, being particularly noticeable in increase of flesh and a remarkable diminution in the number of bacilli in the sputum, as evidenced in the microscopical reports given above.

The bacilli show a marked change in two months time, becoming attenuated and less virile. In case 3 they permanently disappeared in four months. It is my custom to make slides in all these cases about every fifteen days and incorporate them as part of the record. The general vitality is rapidly improved and we have found it difficult to keep patients under treatment because they "felt so good" that they insisted on resuming their employment. We have also been extremely particular in keeping temperature records in each instance and a summary from the following chart will show an interesting evolution in that symptom.

rigid rules for hygienic methods of living. Most of them lived in tent-houses of my designing, but where this was impracticable, I personally inspected the surroundings and sleeping rooms and instructed as the need was. A stuffy room in California is no better than a stuffy room in New York. Living out-of-doors is essential to a cure of consumption in any climate, and our advantage in this respect lies chiefly, if not wholly, in the elimination of the danger of acute exacerbations from extremes of temperature and unavoidable exposure under severe weather conditions. Case 4, which might be styled the worst I have attempted to treat, lived in a tent-house erected on the roof of the porte cochère at his city residence.

My conclusions relative to the rationale of these treatments would lead me to say that high frequency in phthisis produces results through three qualities, viz: thermic, bactericidal, and vibratory or mechanical. The first is demonstrated at each auto-condensation séance by a thermometrical rise of temperature

AVERAGE TEMPERATURE CHART.

	Case 1			Case 2			Case 3			Case 4		
	8 A. M.	1 P. M.	5 P. M.	8 A. M.	1 P. M.	5 P. M.	8 A. M.	1 P. M.	5 P. M.	8 A. M.	1 P. M.	5 P. M.
1st two weeks, ...	97.2	99.2	101	97	99	100	97	99	99.3	96.4	99.4	99.1
1st and second months, . .	97.2	99.3	101	97.1	99	99.3	97	99	99.2	96.4	99.3	99
3d, 4th, 5th, and 6th months,	98	99.4	99.4	97.1	99	99.2	97.1	99.1	99.1	97	99.1	98.2
7th and 8th months, . . .				97.2	98.3	99	97.3	98.4	98.4	97.4	98.4	98.1
9th and 10th months, . . .				97.3	98.3	98.4	97.3	98.2	98.4	99	98.4	98.1

In Case 3 the daily variation in temperature was reduced in ten months from 2 3-5 to 1 1-5; in Case 4 from 2 3-5 to 4-5; Case 2 dropped from 3 to 1 1-5; while Case 1 in three months from 3 3-5 to 1 1-5.

It is hardly necessary for me to say that my instructions to patients include

of at least one and possibly two degrees. Subsidence from this increased bodily heat is very slow. As to the bactericidal properties of the current we can yet only feel sure that it exhibits a strong inhibitive power on bacterial development. My laboratory experiments in this important particular are yet incomplete,

but I am convinced that this second quality is to be considered as an important factor in the general equation.

The vibratory effects are those involving features of stimulation, restoration, and reconstruction. A proper equilibrium follows administration of this current, — a resumption of more normal tonicity where physiological or functional activity is either above or below par. By reduction in arterial tension, stimulation to metabolism, and increased activity in all excreting organs, a long step is taken toward resumption of healthy conditions. Then follows remarkable improvement in assimilation and nutrition, and as the healthy lung cells increase in resisting power the line of demarkation or amputation of diseased tissue more quickly occurs, sloughing is accelerated and we speedily have the great mass of infected tissue removed and chances for healing increased a hundred fold. Reports on this subject to date are insufficient to be supremely convincing, but the most conservative who has done work of this kind must admit that the new current does more than "promise well." I say "new current" because, although the high frequency oscillating currents were known fifty years ago, that which we use today, and due to d'Arsonval, Tesla, and Oudin, is strictly modern.

Relative to apparatus I confess that my demands went beyond any machine in the market, so that I was obliged to make what I needed. Oscillations vary but little, either by difference in length of spark gap, exciting force or construction of apparatus. I believe that quantity and amperage are the key-notes of successful treatment and these should be absolutely under control. A current which will create a static field about a person in the auto-condensation chair is not sufficient. It should be possible to draw a lengthy spark from the person, long enough and fat enough to be painful. Not until this is the case will it be possible to know that current enough is present to produce the profound constitutional and physiological effects necessary to combat a disease like tuberculosis. For local applications the same rule holds as to *abundance* of current. Protracted experiment resulted in my producing a high frequency attachment composed of a spark gap and condenser section fitted with very large Leyden jars, and an Oudin resonator standing about three feet high and twelve inches in diameter. The current generated in this when connected to a 16-inch coil will give an effluve of over 12 inches, and a good fat spark of over 5 inches. With this powerful resonator I can generate a current sufficient to create a static field surprisingly great. This fact was learned in a costly way by the short-circuiting of my shunt-wound one-quarter horse power motor which operated my mercury-jet interrupter. The motor stood at a distance of over six feet from the resonator, and yet was burned out several times before I learned the real cause. As is generally the case the bodily temperature of my patients is subnormal, and I find that a séance in the condensation chair for ten minutes will raise the temperature from 1 to 2 degrees, — never less than one degree even when temperature is normal at the beginning of the treatment.

I wish to emphasize the value of an *abundance* of current and *high amperage*. I use 2,000 to 3,000 milliamperes in routine treatments by the resonator with absolutely no appreciable discomfort or reaction. Incidentally I may mention the value of these heavy current generators for the production of X-rays. I have never yet found a Crooke's tube so "high" that it would not glow when on open circuit with this apparatus. I have had constructed some tubes without anode and with projection for treatment by X-ray in cavities and find them of exceeding great value.

My conclusions are that with appa-

ratus of sufficient power we have in high frequency the current *par excellence* for electro-medical treatments, and that the future will demonstrate its great value in constitutional as well as local diseases. It is gratifying to know that scientific theories uphold all we now claim for electricity as a remedial agent, but, in the words of Mr. Cleveland, "It is a condition and not a theory we have to deal with," and the practicing physician must deal with *facts*. I am therefore glad to add to our knowledge of electro-therapeutics a few more of those *stubborn things*.

DEAF MUTISM, THE TREATMENT BY GALVANO-CAUTERY AND CURE OF A CASE.*

BY F. P. HOOVER, M.D., OF JACKSONVILLE, FLORIDA.

WHEN I was requested to write something for the annual meeting of the Florida State Medical Association, the above subject suggested itself to me, and the report of a case that was brought to me in New York several years ago. Deaf mutism may be acquired or congenital, but the majority of such cases are acquired. It is very difficult to decide the exact time deafness comes on.

The mountainous region is more conducive to this affection than the lower ground. The diagnosis of deaf mutism is hard to determine prior to the fourth or sixth month, when an opinion at that period can be reckoned as to how much a child can hear. The middle ear is usually the seat of the lesion that caused the disease and which may be the result of falls, fits, burns, colic, etc.; suppurative inflammation does not cause as large a percentage of deaf mutism as is supposed.

The disease may be classified under three heads as follows, viz: Inflammation of the middle ear resulting in suppuration or adhesions; anchylosis of the ossicula auditis, etc., or arrested development of some parts of the essential part of the auditory apparatus, as for example, absence of the semicircular canals or of the cochlea; and lastly, inflammation of the nerve or labyrinth resulting in suppuration or thickening of the membranous labyrinth, deposits in it, etc.

The term acquired deafness, or, as I prefer to call it, nervous deafness, is too commonly applied without sufficient discrimination to cases of deafness, the cause of which is unknown, but which further investigation has shown to be dependent upon disease of other parts of the organ of hearing.

Only that kind of dullness of hearing and deafness deserves to be called nervous where there is no obstruction to the conveyance of the sonorous undulations, nor any perceptible organic change of the organs of hearing.

Among certain families, however, there exists a distinct tendency to congenital deafness. It must be remembered that deaf mutes seldom marry. The relationship between the parents is an important etiological factor. In hys-

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* *Read at the Annual Meeting of the Florida State Medical Association, at Jacksonville, Florida, April 19th to 21st,* 1905.

terical subjects a form of mutism occurs suddenly which depends upon functional paresis of the organs concerned in speech; occasionally, too, in children of deficient intellect, articulate speech is difficult or even impossible and sometimes it is difficult or even impossible to differentiate these cases from true deaf mutism.

Statistics have shown, both in America and Europe, that intra-cranial disease is the most common cause of deaf-mutism, and Roosa of New York found the etiological factors as follows: cerebro spinal meningitis, brain fever, convulsions, measles, falls on the head, mumps, scarlatina, meningitis, hydrocephalus, spinal trouble, pneumonia, gastric fever, cholera infantum, intermittent fever, syphilis, and varioloid. Both Politza and Hartman ascribe a large number of cases to typhoid fever. The former also mentions diphtheria as a cause, while the latter puts it on an equal footing with scarlatina. Others have found eustachian obstructions responsible for a large number of cases, while again naso-pharyngeal catarrh with indrawn membranes were the causes of this disease.

It is conceded that if a child loses his hearing, even as late as the seventh year, he will in all probability lose the power of speech. As a rule deaf-mute children are bright, active, and of an inquisitive turn of mind. It must not be forgotten that there are cases recorded of children unable to acquire speech without being either deaf or idiotic. When a child is both deaf and dumb, methodical instruction by a competent teacher should begin early. Several years ago a former patient brought her little girl to see me with about the following history: Child between six and seven years of age. She had had measles over a year prior to that time. Was naturally bright and precocious. Her general health and appetite had always been good and with the exception of the ordinary simple infantile troubles, the attack of measles was the only real sickness she had ever experienced. She could spell, knew her figures, and was considered the smartest of all the small children living in the same apartment house. It was observed that the child after her recovery from the measles, did not seem to hear or pay the same attention when spoken to as formerly. The family doctor thought weakness was the cause and recommended more outdoor exercise and a tonic. Gradually she kept more to herself and lost all interest in play except with her dolls. The mother was taken ill about that time and an operation performed, so she was unable to see much of her child for some time and was then amazed to find that when spoken to, no audible reply would be made.

When the child was brought to me for examination, I found both ear-drums sunken, the right presenting a perforation, but no discharge came therefrom. Her hearing distance by the watch and accumeter was nil, the external canal was free from wax, etc. In the post-nasal pharynx were discovered a number of adenoid turbinate vegetations; in the right nostril there was an hypertrophied middle and thickened mucous membrane. The same condition of mucous membrane existed in left nostril, the patient seldom having to use a handkerchief. The tuning fork showed the same amount of hearing (or lack of hearing) in both ears.

When spoken to and her attention attracted, she would watch the lip movements closely and could follow very well what was said to her. When not observing the speaker, she could hear nothing, neither did she seem to hear loud noises, as clapping of the hands, etc.

I suggested to the mother the removal of the adenoids, which were taken out the same day. The following week with the galvano-cautery, I burnt away the hypertrophied turbinate and during the following two weeks removed with

cautery the redundant mucous membrane. In all I had the patient under my care and observation for six weeks. I could then see no perceptible change in her hearing, but she could breathe comfortably. She did not sleep with her mouth open or snore at night as she did formerly, neither did she have the pinched expression of the face or nostrils.

I suggested a change of air and scene, as the child was somewhat pale and thin, and, as the mother had been advised to go to the seashore by her physician to recuperate, they departed for a quiet resort on the Jersey coast.

It was fully six months before I saw my little patient again, if not longer; owing to her mother having suffered a relapse of her previous illness, the child had been sent to the country after spending two months near the ocean. She had gained in weight fully ten or twelve pounds, was healthy in appearance, and she could then hear noises in the street and the voice at a somewhat higher pitch than the normal. Relatives with whom the patient had visited, were continually talking to and at her, as they were very fond of the child and were rejoiced to note a gradual improvement in her hearing. By degrees she would say a word or two.

I saw the child but a few times prior to my leaving the city, to reside in Florida, when she would answer, when asked a question, and at the table would occasionally speak to her parents, but otherwise was extremely quiet.

It has been a question in my mind whether the removal of the adenoid vegetation alone would have caused the improvement, or whether the cauterization in the nose produced some beneficial reflex action on the acoustic nerve.

MECHANICAL VIBRATION AND DIGESTION

BY HENRY WESTON BARNUM, M.D., OF POUGHKEEPSIE, NEW YORK.

HOW best to treat the many cases of indigestion coming to our offices is a problem giving us great trouble in its solution. The patients are in great distress, as any of us who has "been there" knows too well. The spirit for work, achievement, is gone, the mental powers dulled, desire for life, even, is abating rapidly. In most cases many remedies have been used, many doctors consulted, and still no relief obtained. Careful inquiry and examination show no ulcers, no organic stomach lesions of any nature. The trouble is entirely functional, brought on by over-indulgence at the table. Shall we go on in the old way? It is by far the easiest for us to write a prescription and dismiss the case; but is that the wise way? There is a better way.

During the past two years mechanical vibration in the treatment of disease conditions has very rapidly sprung into favor, and in few conditions have its results been superior to those obtained in the affections under consideration.

How shall we consider the treatment of a case of functional dyspepsia? Study the case carefully as to causes, symptoms, former treatment. Mechanical treatment supposes all drugs withdrawn, but that may not be best in the case before us. For a time, then, it may be well to give some simple aid to digestion. Careful study of the *patient*

will determine this point.

It will not be difficult to gain an admission from the patient that medicines have failed to cure. At once draw the attention to the vibrator as a means of treatment, explain its action, and urge its adoption. Show that you understand this action by reference to the sympathetic nerves and vagi through which the results are largely obtained. By this time the patient is interested, hopeful, ready to begin treatment.

Remove sufficient clothing to permit easy examination of the spine for tender centers, lay the patient on the table, face down, arms hanging down to separate scapulæ, and, beginning at the second dorsal nerve, press on each nerve to the lumbars.

Tenderness will usually be found at one or more points between the second and the ninth. In very recent cases no tenderness may be found if the symptoms are mild. The ninth dorsal will be tender if the congestion be at pyloric end of the stomach; the sixth and seventh will be tender if the cardiac end be the seat of the trouble.

The patient will be greatly surprised at the finding of these tender points, and it may be well to locate all the tender centers you can find in the entire spine; this will help to explain other symptoms the patient may present and sometimes render possible a diagnosis of other derangements than that under consideration.

Using a soft vibratode apply treatment, medium stroke and pressure, to the above-named dorsal nerves for two or three seconds each, intermittently, going over the area three or four times. Where the centers are tender, use steady pressure for from ten to twenty seconds to inhibit pain. After a few treatments, daily, the ball vibratode may be used, as then the tenderness will have disappeared.

Now let the patient turn on his back, and apply vibration to the vagi opposite the most prominent part of the larynx, for ten seconds each, intermittently, using medium stroke and pressure. Stimulate next the solar plexus, placing vibratode about two inches below the sternum, for ten seconds. Vibrate the stomach by following the greater curvature from left to right, pressing the vibratode deeply into the abdominal walls, directing the force toward the pylorus. Let the vibration be intermittent and continued about five minutes. Perhaps the best time to treat the case is from half an hour to an hour after a meal, as then the gastric glands are the most active.

Vibration should be applied to the liver for three or four minutes, pressing the vibratode deeply between the ribs. This, if done intermittently, will increase the outflow of bile. The pancreas was stimulated by the treatment to the stomach.

This method of treatment should be repeated every day for a week or more, or until improvement is positive, when twice or three times a week will be sufficient. It is usual to see good results in two or three days in most cases. Of course the diet must be regulated, complete and positive directions given as to what and how to eat and drink. These patients are depressed mentally, and we must get control of their minds, imbue them with confidence, lift them out of their despondency.

Besides treating the spinal centers directly involved, it is often of benefit to vibrate the centers of the entire spine, for the general tonic effect; it is also often necessary to treat the abdomen for the ever present constipation.

Suppose we have a case of ulcer of the stomach; would vibration be of benefit? Yes, and the treatment would be along the same lines, with the addition of large doses of bismuth sub-nitrate half an hour before meals. The spinal treatment here should be of decided benefit, as it stimulates the vasomotor and tro-

phic nerves of the stomach, relieving congestion and promoting nutrition.

To treat these cases successfully the practitioner should study the technique and the principles involved, and he will be amply repaid. It pays both doctor and patient if the treatment of disease by vibration be investigated; because the former will get the business and the latter will get relief. Cultivate office practice and keep busy.

Let me cite one case: Woman, aged about fifty, wife of a farmer. Indigestion for five years. Poor appetite, flatulence, constipation, distress after eating, losing flesh, discouraged. Examination revealed tender centers between the scapulæ. Very tender over the stomach also. Vibration was applied as above outlined. After the second treatment, she reported improvement, more marked after the third, appetite increasing. After seven treatments, she had no more discomfort, and as my vacation was at hand, I saw her no more. After my return she did not come to the office as I had expected her to do, but I heard from her and there has been no return of the symptoms in six months.

It is not to be expected that every case will respond as the one above reported. In some cases, perhaps, there will be failure, though I have yet to meet such a case where the patient has been faithful to the treatment.

EDITORIAL

THE BERLIN ROENTGEN CONGRESS

Probably the most important and instructive of the many conventions which have been held for the purpose of developing and disseminating knowledge relating to the immortal discovery of Roentgen, is that which was held in Berlin, Germany, from April 30 to May 3, 1905. That interest in the event was widespread is evidenced by the fact that over 2,500 electrologists and radiologists were present from all parts of the world, a number approaching the largest registration of attendance at any session of the American Medical Association. When it is considered that this large body of scientists had been drawn together by their enthusiastic interest in only *one* of the many medical and surgical specialties, the Roentgen ray is seen to have established for itself a position of commanding rank in the armamentarium of the physician; the fact that it is useful, in some degree, in nearly every department of medical science is also largely responsible for the size of the Congress, and constitutes as well a strong argument in favor of holding such meetings frequently in the future in order that the fullest possible development of this force may be attained, and the interests of humanity and science served thereby.

An important feature of the Congress was the department of exhibits, of which there were seventy; eighteen by medical and surgical institutions, twenty by individual physicians and surgeons, and thirty-two by manufacturing firms. All sorts of Roentgen ray apparatus, and illustrations and demonstrations of the results attainable in the various departments of medicine and surgery, were to be found in this section of the Congress.

Lack of space forbids setting forth the proceedings of this convention in any detail here; they will be published in full, under the editorship of Dr. Albers-Schönberg, by L. Graefe und Sillem, Kaiser Wilhelm Strasse, 82, Hamburg, Germany, and copies issued to all members of the Congress as well as to all others who desire them in the near future. One of the resultant events, however, we believe to be of sufficient importance to justify brief mention here, viz.: the adoption of an uniform Roentgen ray nomenclature, involving abandonment of the term "X"-ray, and universal incorporation of the name Roentgen instead. This results not only in a much-to-be-desired simplification and definition in the terminology, but constitutes a well-deserved tribute to the discoverer of this force, and, we believe, will be welcomed by all workers in this field. In the future, therefore, we shall hear more of "Roentgenography" and less of "radiography" and "skiagraphy," more of "Roentgenoscopy" than fluoroscopy, of "Roentgenograms" than of radiographs or skiagraphs; radiology becomes "Roentgenology," etc., etc.

Another result which promises to be of some importance as regards the future development of Roentgenology, was the formation of a national German Roentgen Society with which a large number of the foreigners present at once affiliated. The business management of this body was placed in the hands of the Berlin Roentgen Society, which evolved and carried to such a phenomenally successful termination, the Berlin Roentgen Congress.

SECOND SPECIAL NUMBER

The next (September) issue of the ARCHIVES will be a *special number,* in honor of the Annual Conventions of the American Electro-Therapeutic Association and the American Roentgen Ray Society, which take place, respectively, at the New York Academy of Medicine, 17 West 43d St., New York City, Tuesday, Wednesday, and Thursday, September 19, 20, and 21, and at the Johns Hopkins University, Baltimore, Md., Thursday, Friday, and Saturday, September 28, 29, and 30, 1905.

CURRENT PHYSIOLOGICAL THERAPY

JOURNAL OF ADVANCED THERAPEUTICS

New York, N. Y., June, 1905

1. Physicotherapy of Neurasthenia — J. A. Riviere.
2. Report of the Committee on Current Classification and Nomenclature of the American Electro-Therapeutic Association.
3. Mechanical Vibration Therapy — Frederick H. Morse.
4. Principles of Psychotherapy (*to be continued*) — Leslie Meacham.
5. Physics of High-Frequency Currents with Special Reference to Their Use in Therapeutics (*to be continued*) — Earle L. Ovington.
6. Massage and Exercise Contrasted — Max J. Walter.

1. See the ARCHIVES for July, 1905.
2. See the ARCHIVES for June, 1905.
3. Morse considers that a properly constructed and manipulated mechanical vibratory apparatus can do all that can be accomplished by massage, but that manual massage is unable to act as profoundly and deeply, especially as regards influence upon the nervous control of organs and tissues, as is mechanical vibratory stimulation. In the application of mechanical vibratory stimulation a knowledge of anatomy as regards the origin, course, and distribution of the nervous supply of the body and of the superficial and deep lymphatics is very important. It is also necessary to know what particular kind of vibration should be applied in the individual case and how to secure modifications of effect with the apparatus; for instance, for deep vibration a heavy stroke with more or less pressure should be applied, for stimulation much lighter pressure and greater rapidity of stroke, for superficial vibratory massage a lateral instead of an oscillatory stroke, the latter being more efficient for the production of vibration and stimulation. The empirical use of a vibratory apparatus, or its use by one who does not possess and apply such anatomical knowledge, is as likely to be harmful as beneficial.

Diseases and conditions in which this form of therapy is recommended are anemia, hysteria, insomnia, and the prostration following acute disease, especially la grippe; the technique outlined for such cases is vibratory massage to the neck for about one minute, stimulation to the spine for about five minutes, and a longer stimulant application to the extremities, the main object being to improve the nutrition of the spinal nerve centers, thereby increasing functional activity of all the viscera.

Neuritis responds well to vibratory stimulation applied as nearly as possible to the origin of the affected nerves. Diminution of the sugar excreted and a general improvement frequently follows vibratory stimulation applied to diabetics, and relief of symptoms in cases of locomotor ataxia. Chronic gastritis, with or without dilatation of the stomach, frequently responds well even without any medication.

4. This article will be abstracted when it is concluded.

5. This article will be abstracted when it is concluded.

6. Walter calls attention to the fact that massage is a normal physiological process, carried on in the body during health by functionation of the muscles, intermittent descent and ascent of the diaphragm whereby the abdominal organs are alternately compressed and re-

leased, etc. When, through sickness or other causes, this natural massage (exercise) is interfered with, manual massage will take its place, indeed will do more than natural exercise. This latter fact is proven by the experiments of Sterling, Kroneker, Zabludowski, and others, in which it was proven that a fatigued muscle recovers more rapidly if it was massaged than if it was allowed simply to rest, and that a man who could lift a weight of one kilo eight hundred and forty times before utter exhaustion supervened, was able to lift the same weight over 1,100 times without fatigue after 10 minutes of massage; the weight of thin subjects is often increased by massage and that of corpulent subjects decreased. The muscular strength is usually materially increased. There is diminution of urates and decrease of sulphates in the urine, accentuated peristaltic action of the bowels, greater ease of the bodily movements, improved sleep, and improved frame of mind; all the bodily functions seem to be carried out in better form.

Massage also differs from active exercise because under it the heart action actually decreases, while active exercise quickens the same; blood pressure is diminished. Massage is therefore of great use in patients who are unable to take active natural exercise whether their general condition is characterized by strength or the weakness of extreme prostration. The predominant element in its beneficent influence would seem to be that by its use the blood is forced through muscles and tissues, thereby conducing to their nourishment, whereas if the organs are simply at rest the blood is more inclined to flow *around than through* them.

ARCHIVES OF THE ROENTGEN RAY

London, England. June, 1905

1. Method of Measuring the Dose of Static Electricity — L. Benoist.
2. A Case of Spleno-Medullary Leukemia Treated by X-Ray — John R. Levack.
3. Vegetable Versus Animal Food — John Haddon.
4. On Osseous Formation in Muscles Due to Injury (Traumatic Myositis Ossificans (*continued*) — Robert Jones and David Morgan.
5. High-Frequency Currents: Some Infective Diseases Amenable to Treatment (*continued*) — Clarence A. Wright.

1. Benoist measures a dose of static electricity as follows: The patient, insulated and connected with a static machine, is considered as covered by a layer of electricity in mobile equilibrium so long as the output of the machine and the leakage remain constant. The density of this layer determines the physiological and therapeutic effect. This density may be measured by use of a proof-plane consisting of a small metallic disc, with insulated handles. Upon touching the patient and being removed it remains charged with a charge of the same density. If it now is brought in contact with an electroscope of known capacity, the charge may be measured by the repulsive action of the aluminum leaves. Under ordinary treatment the patient will be found charged with from 5 to 10 C. G. S. units per square centimeter.

Benoist proposes to call a C. G. S. unit a franklin, and considers it as equal to one-third of a micromilli-coulomb. This is proposed as the absolute unit of electrical quantity and electrical density will be described as so many franklins per square centimeter. He calls the instrument an electro-densimeter. It is graduated both in degrees and in absolute units or franklins per square centimeter. The charge of the proof-plane

is transferred to a vertical metallic disc on which is fixed a movable aluminum leaf. This leaf is repelled from the disc at an angle corresponding to the quantity of electricity communicated.

2. Levack's case, a woman aged 28, began treatment in August, 1904. Family history negative, present illness dates from March, 1903, when she began to lose flesh and discovered a lump projecting beneath the lower ribs on the left side. The patient was pale, skin dry, body temperature 100° F., pulse 91, systolic murmur in second left intercostal space. Abdomen distended, spleen markedly enlarged, no enlarged glands in groin, axilla, or neck. Blood examination gave blood hæmoglobin 50 per cent., leucocytes 161,600, red blood cells 2,980,000. Differential leucocyte count; small lymphocytes 4.2 per cent., large lymphocytes 10.6 per cent., polymorphonuclears 23.5 per cent., eosinophiles 1.6, myelocytes 44.5 per cent., neucleated red cells 4,848 per cubic millimeter.

Treatment began September 12, 1904, and consisted of daily X-ray exposures of the splenic area and lower ends of the thigh-bone, ten-inch coil, 110 volts, electrolytic break, fairly high tube, anode 9 inches distant from the skin. Treatment duration from 3 to 5 minutes. Treatments regularly until 1905, 98 in all. Slight dermatitis occurred in October, causing stoppage of treatment for a week.

After three months' treatment the blood count was hæmoglobin, 68 per cent., leucocytes 58,800, red blood corpuscles 3,308,000. Five weeks after treatment was completed the blood count was hæmoglobin 75 per cent., leucocytes 76,100, red blood cells 3,878,000; ratio of leucocytes to red corpuscles 1.51. The spleen was distinctly smaller, the abdomen was reduced from 30½ to 28 inches, general condition was improved. Menstruation, which had been absent for 2½ years, appeared two months after X-ray treatment had begun and has been regular ever since. The slight reduction in the spleen was probably due to secondary fibrosis on which the ray could have slight effect.

3. Haddon reviews the work of Schilling, Jaffa, Voit, and others, in the determination of the comparative value of animal and vegetable food.

Schilling considers that the main value of vegetable products is to add relish and stimulate the appetite, since they undergo slight digestive changes, though he admits that they supply various necessary organic salts and acids.

Jaffa says that fruit is considered as a supplementary food rather than a staple article of diet. He records studies of children eating fruit, nuts, and vegetables alone, and finds nearly three-fourths of the protein and fat was derived from the nuts. Comparing the results with common accepted standards it would appear that the subjects were decidedly under-nourished, yet they had the appearance of health and strength, were well, ran and played all day like healthy children. There was practically no waste. He reports in his own case that feeling languid and suffering from acid dyspepsia, he estimated his urea to vary from 13 to 26 grammes daily. He did not suspect that he was overeating. He gave up all animal food except eggs and milk, ate only at 8 A. M. and 3 P. M., and was astonished at his symptoms and feelings. He was capable of much muscular work and life became a pleasure. He again examined for urea and instead of 26 grammes found but 12 to 14.

Estimation of urea made upon a vegetarian and a man who ate animal food showed the vegetarian passed 11 grammes of urea and the meat eater 22. He concluded that urea depends not upon work done, but diet, and that when we eat more than we need, it remains to poison the system.

He concludes that the old saying is true that, "we dig our graves with our teeth," and pleads for the establishment

of a chair of dietetics in every medical school, and that the future practitioner will be taught as much about food as about drugs.

4. Jones and Morgan continue their discussion of osseous formation in the muscles due to injury. They are of the opinion that in the majority of cases the growth springs from the periosteum, basing this upon the frequency with which these growths are associated with dislocation, their frequent attachment to bone, their growth between bone and muscle, and sometimes their attachment below the muscle origin which has been subject to violent strain. In nine-tenths of the cases the appearances are marked in the first two months; in a few cases several months have elapsed before changes were noted.

In one case of unreduced dislocation of several weeks' standing, a radiograph showed a fine osteal line extending from the top of the olecranon to the lower end of the humerus 25 days after an attempt at reduction. The next day the dislocation was reduced and a week later a radiograph showed development of the osteal line and fine bone deposit in front of the elbow joint. One month later the elbow was anchylosed and a radiograph showed a dense mass of bone bridging over the edge of the elbow, attached to the humerus, ulna, and radius. Posteriorly massive bone extended from the humerus to the olecranon. Clinically the condition may be suspected when after intelligent treatment of a dislocation, the range of movement diminishes and hardened tissue presents in neighborhood of the joint. During the formation of bone the tissues are swollen and painful to pressure. The range of movement generally decreases and the patient does not complain of pain.

5. Wright continues the treatment of infective diseases by high-frequency currents. In all tubercular affections accompanied by exudation, the effluve of high frequency is instrumental in promoting absorption. It is also applied in tubercular peritonitis, but if diarrhœa is present derivation methods are to be preferred.

The effused fluid generally absorbs after the sixth to tenth application, but treatment must be continued, and there is always a tendency to relapse. He reports a pleurisy with effusion treated by effluve from an Oudin resonator, with rapid recovery, a diminution of the cough occurring from the first application.

A case of tubercular peritonitis, with pulmonary tuberculosis, sputum containing bacilli in great numbers, was treated as follows: bipolar derivation 200 milliamperes, one electrode over the abdomen and the other over the right lung, 15 minutes daily. After the eighth session, the abdominal tenderness disappeared, diarrhœa ceased, cough and expectoration were less, the mesenteric glands were smaller. In another month digestion was good, pain in the abdomen had ceased, there was no ascites. Abdominal glands could not be distinguished and his abdominal condition was apparently cured. The pulmonary condition, however, while much improved, persisted. He was sent to the country for three months, and now is vigorous.

A case of house-maids' knee was completely cured by a few treatments of effluvation.

ARCHIVES D'ELECTRICITE MEDICALE

Bordeaux, France. May 25, 1905

1. X-Ray Treatment of Lipomata and Especially of Dercum's Disease — Dr. Th. Nogier.
2. Localization and Extraction of Projectiles, Procedure Based on Simple Radioscopy — Prof. Tuffier and Dr. G. Haret.
3. X-Ray Treatment of Tinea — Profs. E. Bodin and E. Castex.

1. Nogier has treated two cases of Dercum's disease (painful lipomatosus) and one case of isolated lipoma of the back. Only one case continued under treatment and this is reported in detail. Causative elements were a fall when the woman was about 23 years old, confining her to bed for three months and necessitating an abdominal belt thereafter. The more immediate cause was a salpingo-oöphoritis for which she was operated upon at the age of 38. Five or six months later she developed pain on the inner aspect of the left thigh above the knee and some months later the tumefactions which have remained to the present time. She is now fifty years old. A six months' course of thyroid feeding and treatment by iodide of potassium, etc., failed to produce any effect. Large masses were symmetrically located upon the inner aspects of the thighs, the groins, and the buttocks, above the epitrochlea, on the inner aspect of arm in its upper third and in the deltoid region. There was a mass upon each shoulder blade and one in the supraclavicular fossa. The masses were of a pasty consistence and indefinite outline, and pinching the skin was painful, causing it to wrinkle like orange peel and produced small extravasations of blood. The superficial veins were everywhere unusually developed and indicated vaso-motor disturbances. Frequent epistaxis.

A Ducretet coil of 25 cm. spark length was used, excited by a direct current of 60 volts, with a mercury dip interrupter and a primary current of 4 amperes, and a Muller tube. He uses the spintherometer and Benoist's radiochromometer to determine the quality of the ray and Labouraud and Noire's radiometer for estimating the quantity absorbed at each dose.

Three of the largest tumors were treated separately, each at a distance of 16 cm. from the anticathode, for eight or nine minutes three times a week, making 4 H. a week in divided doses, or 17 or 18 H. from March 19 to May 13, 1904. The rays were No. 6 Benoist. At the end of this time the circumference of the right arm had diminished 48 millimeters. The other regions had received a smaller number of treatments, but had improved in proportion. The patient's weight fell from 63 7/10 kilogrammes in January to 60 9/10 Kg. in May. The patient had previously suffered from melancholia and her mental condition now became normal.

The patient had been taking sixty drops of tincture of iodine daily for six months, but there had been no improvement until the X-ray treatment was added. The X-ray and the internal administration of iodine were continued for over a year with very great improvement in the general health and great diminution, but not complete disappearance of the lipomata.

Another case of Dercum's disease was only treated for a day or two, 3 H. caused complete disappearance of the pain and the patient ceased treatment. No apparent change in the lipoma.

The case of single large lipoma over the shoulder blade. No medicinal treatment. Fifteen H. applied in divided doses in a month, the patient then went back to the country on account of his work. The tumor was somewhat smaller and softer and the skin less tense.

2. This apparatus for locating projectiles and other foreign bodies is best understood from a description of its use in the case of the thorax. The patient stands in front of an X-ray tube, and by means of the fluoroscope and a dermographic pencil with a metallic handle, are marked the points of entrance and exit of a ray passing through the foreign body. Then turning the patient around the points of entrance and exit of a ray passing through the foreign body in a different direction are marked upon the skin. The foreign body of course lies at the intersection of these two lines. No

further use is made of the X-ray.

A strip of flexible metal is now molded around the body at the level of these marks and corresponding marks are placed upon it. The strip is then carefully removed, laid on a table and brought into the body-shape again. Cross wires are passed between the points marked on the metal strip, their intersection indicating the position of the foreign body.

The most favorable point for the incision is determined and opposite this is fastened a binding post with pointer which is securely fastened so that it points exactly toward the position of the foreign body. The cross wires are then removed and the metal strip with its pointer are applied to the chest. These have been sterilized and remain in position during the operation.

He describes seven cases in which he used this method successfully.

First, two revolver bullets in the chest.

Second, a revolver bullet in the arm.

Third, revolver bullet in the tongue.

Fourth, revolver bullet in the chest.

Fifth, revolver bullet in the thigh.

Sixth, revolver bullet in the spleen for two or three years. Successful removal; after eight days convalescence, undue excrtion, pneumothorax, and death.

Seventh, revolver bullet in anterior fossa of the skull for three years.

3. The X-ray will cure not 90 or 95 or 98 per cent., but every case of tinea of the hairy scalp. The filaments and mycelial spores of the achorion, tricophyton, and microsporum occur in the superficial layers of the skin and penetrate into the substance of the hairs and to the bottom of the hair follicles. It is impossible for any solid, liquid, or gaseous microbicide to reach them all. Treatment by epilation is made ineffective by the friable condition of the hairs. Treatment by epilation and microbicides takes from a year and a half to three years and all that time a child with ring-worm has to be kept out of school. If a patch of tinea is exposed to the X-ray for a certain time the hair follicles cease their functional activity, the hair becomes a foreign body and is cast off with the dead micro-organisms in about 20 days. During this time the scalp should be kept disinfected on the surface with tincture of iodine or sulphur ointment. The case is cured in 20 days, but a smooth bald spot remains over which the hair is completely renewed in three months.

Technique. Radiquet 55 cm. induction coil, Contremoulins-Gaiffe interrupter (1,500 per minute), Chabaud-Villard osmoregulator tube. Benoist's radiochromometer rays No. 4. Holzknecht's chromoradiometer 4 or 5 H., at 15 cm. from anticathode to the scalp. Labouraud and Noire have shown that barium platino-cyanide may be used in the same way. They use a test paper tinted a standard color. When the barium platino-cyanide placed at a distance of 8 cm. from the anticathode has changed to the color of the test paper, the scalp at a distance of 15 cm. from the anticathode has received sufficient X-rays to cause epilation and cure without danger of burning or permanent alopecia.

Neighboring parts are protected by sheet-lead one-tenth millimeter thick, which is grounded to prevent disagreeable electrical discharges. Too strong an application will cause dermatitis with redness, suppuration, or sloughing according to its severity. If this is severe it leaves permanent bald cicatrices; too weak an application fails to cure. The authors have in the last six months treated 25 cases of tricophytosis and tinea tonsurans, due to microsporon, with uniform success, all of the children were able to return to their homes and schools 25 days after the application of the X-ray. The hair all grew out again in three and a half or four months. In the St. Louis Hospital, class for ring-worm

cases, Labouraud has cured 134 cases in six months, and the introduction of this marvelous remedy has reduced the number of beds required for ring-worm cases by 100.

BULLETIN OFFICIEL DE LA SOCIETE FRANCAISE D'ELECTROTHERAPIE

Paris, France. April, 1905

1. A New Radiometer — Dr. Denis Courtade.
2. Seventeen Cases of Primary or Secondary Cancer of the Skin Treated by the X-Ray — Dr. Rene Desplats.
3. Peripheral Neuritis following Varicella — Dr. G. Allaire.

1. For radiography or therapy it is necessary to measure the quality and the quantity of the X-rays. The first is determined readily and accurately by the spintherometer and by Benoist's radiochromometer or any similar instrument for measuring the degree of penetration. The quantity may be determined indirectly by noting the strength of current passing through the tube (Gaiffe's milliamperemeter) or directly by measuring, first, the ionization and consequent electrical conductivity produced in gases; second, the chemical effect upon different substances; third, the fluorescence induced in different substances. Courtade's radiometer is based upon the last-named. He uses a barium platino-cyanide screen, a part of which is made luminous by radium and serves as a standard of comparison. The apparatus, made by Gaiffe, is composed of a metallic plate with a central perforation one centimeter in diameter, around which are 12 other perforations. A few centigrammes of a radium salt of moderate activity are placed behind the central orifice. The X-ray shines through the other orifices, which are covered with sheets of silver varying from 2/100 of a millimeter to 16/100 of a millimeter in thickness. The radiometer being always placed at the same distance from the anticathode, the quantity of X-ray is determined by noting which circle corresponds in luminosity with the central one illumined by radium.

Several cases of conjunctivitis from the X-ray were alluded to in the discussion.

2. Desplats's technique at first consisted in short applications frequently repeated until a reaction was visible. He considers this now a waste of the patient's and his own time. At present he uses a 10-plate Drault static machine giving a 30 to 35 cm. spark, and a large Villard osmoregulator tube with a Beclere stand. The spintherometer, Benoist's radiochromometer, and Labouraud and Noire's radiometer are his instruments of precision. Three centimeters spark equivalent more or less, regulated by the depth of the cutaneous lesion, rays 5 or 6 of Benoist's scale and quantity 5½ H., in 17 or 18 minutes at a distance of 15 centimeters from the anticathode. First seance ten or twelve minutes or between 3 and 5 H. The following day or the next day but one, a second seance of 10 minutes. This may be followed by a third somewhat shorter application. Either 8 H. in two applications or 10 H. divided into three applications, twenty days intermission. Always secures notable improvement thus with quite an active reaction. A second series or even a third and fourth are given if necessary with the same intermission.

Primary cancers of the skin, in Desplat's experience, are practically invariably cured; but the rapidity with which this takes place varies, and it is not always the most extensive, vegetating, and serious looking that are the slowest to heal. One of his cases presented an enormous granulating mass occupying the upper and lower eyelid and the side of the nose completely concealing the eye; this was cured in six weeks, the ul-

ceration being covered by epidermis; treatment was continued for several months. Another class of cases are scarcely malignant in appearance, but require great patience to completely cure. They belong to the "spino-cellulaire" epitheliomata described by Darier. But even for these the X-ray is more successful than excision or caustics.

One patient with secondary cancer of the skin was 65 years old. Five years previously a tumor of the breast had been removed by some caustic application and the ulcer had healed. Recently this had broken out again and was accompanied by redness and thickening of the skin on the anterior surface of the chest and the left side and part of the back. This was due to a chronic lymphangitis. In five weeks the ulceration was healed and all trace of lymphangitis had disappeared, but there were signs of pleurisy at the base of the lung and the patient died some months later of a cancerous pleurisy.

However, all recurrent cancers do not have the same tendency to general diffusion and the X-ray will render good service in removing local lesions and in preventing recurrence after surgical operation.

3. The patient, a boy of 6, had rather a severe case of chicken-pox with suppurative bullæ on the face and shoulder and pus flowing from the left ear. After recovery it was found that the left upper extremity was paralyzed and also the velum palati. At one time during the treatment of the case there was diplopia from paralysis of one of the ocular muscles. Electrodiagnosis showed much diminished faradic excitability both of nerves and muscles and increased galvanic excitability with the reaction of degeneration. The boy could move his arm a little from his side, but could not raise his hand to his head or flex the forearm or produce abduction or adduction of the fingers. Treatment by galvanic electricity resulted in almost a complete cure in about a month, but there was still some paralysis of the interossii at this time. The mother, however, thought the child was all right and took him to the country.

JOURNAL DE PHYSIOTHERAPIE

Paris, France. May 15, 1905

1. Seaside and Forest Cure for Tuberculosis and Pretuberculosis — Dr. Louis Guinon.
2. Development and Present State of Radiology — Dr. Albers-Schönberg.

1. A. The predisposed are those with an hereditary constitution favorable to tuberculosis, or with a local tuberculosis or a tuberculigenous disease. Among these individuals are slightly-developed young persons, those with narrow chests, persons of an infantile type, those with red hair of the Venetian type, young girls with mitral stenosis. Those with caseous or articular tuberculosis and adenopathy and tubercular peritonitis are especially favorably influenced by the seaside and forest treatment. Measles and whooping cough are decided predisposing factors.

B. The pretubercular are those with tuberculosis of the pulmonary adnexa whose general condition indicates an approaching pulmonary tuberculosis, but who do not yet present auscultatory signs. Some of these have bronchial adenopathy, and others have had pleurisy, congestion, prolonged bronchitis, or broncho-pneumonia.

C. Latent pulmonary tuberculosis which can be made out by ausculation. He believes the diagnosis of consumption should always be made and treatment begun before the appearance of cough. Some of the rational symptoms are progressive loss of weight, usually but not always anæmia, fever, palpitation, and tachycardia.

D. Among the fully developed cases

of pulmonary tuberculosis, those for whom the forest and seaside treatment is suited are especially those with arthritic, congestive, neuropathic, erythric constitutions and those with insomnia. He does not think patients with galloping consumption have anything to gain by a change of climate.

The forest and seaside treatment at Arcachon is really the subject of this paper. There is a winter town of separate cottages in the midst of gardens and pine trees and with the streets winding so as to offer as much shelter as possible from the wind. The "summer town" is close to the seashore and the rooms facing the ocean are those with the greatest amount of sunlight. Between the two is a region of mixed qualities. Most patients spend the winter in the forest town except perhaps a couple of the coldest months, and spend the summer except a couple of the hottest months in the seaside town. Diet, clothing, day and night ventilation, exercise, disinfection of all toilet utensils, etc., are all very exactly regulated. When patients are strong enough sea bathing and boating are added. The sea air has a very marked effect upon the fever. Its beneficial action is due to, first, intensity of aeration and absolute purity of the air; second, exceptional luminosity of the air (this is shown by the rapidity with which pigmentation of the skin occurs); third, the motion of the boat produces favorable muscular, circulatory, and nervous effects.

The forest treatment is based on three principles: rest, super-aeration, and super-alimentation. The rest cure is continued as long as there is a rise of temperature and is best given in a reclining chair. Super-alimentation is cautiously carried on so as to avoid a final complete loss of appetite. The effects of the forest treatment are progressive. The patient readily becomes acclimated; cough diminishes; respiration becomes less rapid and freer; expectoration is easier; and cough ceases except for expectoration. In due time sleep improves, temperature oscillations become less and an increase in weight takes place.

Three stages of treatment are to be recommended, a rest cure in the forest, quiet at the seashore, and finally boating, etc. But the patient will do well to have occasional changing of climate and altitude.

2. Albers-Schönberg read this paper at the Roentgen Congress, Berlin, April 30, 1905. The first epoch of X-ray work was characterized by the use of induction coils with mechanical interrupters, first a platinum hammer, then a mercury interrupter. Large apparatus gave a spark of 39 to 50 centimeters. The rays were weak and the exposures had to be very long. Good pictures were obtained more or less by accident and it was rare to obtain a picture of renal calculi. Burns were frequent because of the long exposures. The second epoch saw the introduction of the Wehnelt and Simon interrupters; and later improvements in the X-ray tube, and Walter's rectifier for alternating currents. With a water-cooled tube and a powerful current one can now obtain very good plates of the human thorax in one minute at a distance of two meters, and Albers-Schönberg has personally made out renal calculi with the fluoroscope. The third epoch has seen the introduction of diaphragms and screens for radiography and fluoroscopy and a consequent improvement in definition. For pictures of renal calculi and for fluoroscopic diagnosis of pulmonary conditions he considers this most important. The fourth period brings the knowledge of the destructive effect of the X-ray and the action of the X-ray upon internal organs. The first experimenters sometimes burnt their patients and almost always produced serious effects upon their own hands, sometimes their eyes and their general systems have suffered. Various

radiometers have been introduced, also X-ray proof gloves, and the operator has learned to keep watching the plane of the anticathode or even in some instances to stand in a sort of protective sentry box. The tube is enclosed in an opaque box with an orifice for fluoroscopy, and the only rays reaching the operator have already passed through the body of the patient. Lead glass is used in the same way. The orthodiagraph has been introduced. Radiography has proven of great value in dentistry, and the technic is simply holding a film inside the mouth and allowing the X-ray to shine from the outside.

He then reviews the reasons why radiology should be a specialty and not employed by general practitioners of medicine. It requires a special knowledge of anatomy and surgery and of electrical technique and constant practice. It is dangerous to the operator except where every precaution is available. The cost is so great as to be prohibitive unless at least 500 cases a year are examined. In radiotherapy the inexpert may do such serious injury to their patients that the public have a right to demand that only properly-qualified specialists should employ the method.

FORTSCHRITTE AUF DEM GEBIETE DER ROENTGENSTRAHLEN

Berlin, Germany, April 5, 1905

1. Contribution to the Study of Fractures of the Neck of the Femur during Childhood and Youth, and their Relation to Coxa Vara — E. Siebs.
2. Roentgen Localization of Foreign Bodies in the Eye — S. Holth.
3. Small and Large Inductors — Wertheim Salomonson.
4. Experiences with a New Radiometer of Sabouraud and Noire—H. E. Schmidt.
5. Upon Roentgen Treatment of Sarcoma — Tage Sjögren.
6. The Avoidance of Disturbing Soft Tissue Shadows in Radiography, Especially of the Pelvis — S. Haffner.
7. Two Cases of Congenital Defects of the Hip — Hermann Riedl.
8. Concerning Roentgen Tubes, Free from Reverse Discharge Light — F. J. Koch and K. A. Sterzel.
9. A Universal Shield and Screen for X-Ray Work — Max Levy-Dorn.

1. Siebs studies six cases carefully and concludes that many cases of so-called coxa vara traumatica in young persons are nothing more than separation of the epiphyses upon an underlying pathological softening of the neck of the femur. The determining cause of the epiphyseal separation is often a slight traumatism, though this separation may take place spontaneously.

The softening of the neck of the femur is indicated in the radiograph by the bending of the neck. Two of the cases reported showed no bending of the femur neck, even though the injury had occurred some time before, and are therefore clear cases of coxa trauma, and as evidence he cites a case in which this condition was present in both hips with no distinct history of an injury. At times it is necessary to take views of the hip at different angles, in order to show either a fracture or bending of the neck. The article is illustrated by beautiful skiagraphs.

2. Holth describes a simple little device by which he has been localizing foreign bodies in the eye since 1902. It consists of a small plano-convex button 2 mm. in diameter, containing two holes through which a very fine silk thread is drawn and by which it is attached to the conjunctiva. One of these is placed at the upper and another at the lower corneo-scleral margin. The conjunctiva is of course cocainized previously. Two skiagraphs are then taken, one in the lateral and the other in the antero-posterior position. He also illustrates an arrangement by which he holds the head and the plate in position. He also calls attention to Dr. Fox's localizer, in which

the same principles of antero-posterior and lateral exposures are followed.

3. Salomonson makes a comparison of the relative value of the large and the small coil, and publishes a table illustrating their relative value. He concludes in favor of the large coils and recommends at least a coil producing a 25 cm. spark.

4. Schmidt reviews some of his experiences with the radiometer of Sabouraud and Noire. Briefly this consists of a reagent paper impregnated with barium-platino-cyanide, which under the influence of the Roentgen rays changes from a light green color to a yellow, or if the action is continued to a red. If a patient is exposed until this paper turns to a yellow a mild erythema develops, and if carried to the point of redness of the paper the skin will become swollen and inflamed. He recommends its use.

5. Sjögren reviews several cases of sarcoma, treated by other men with remarkable results. He then reports three cases of sarcoma of his own. The first was a patient 48 years old, with a sarcoma involving the right side of the nose. It was of the spindle-celled type, and showed a decrease in size after the first week. No reaction worthy of mention was obtained. After two weeks of treatment, a section was again taken which showed a complete disappearance of sarcoma cells, and at other places no change. Some of the nuclei took no stain. After 7 weeks and 30 seances treatment was discontinued. After 4 months no evidence of the sarcoma could be seen. A second case of spindle-celled sarcoma disappeared in 3 months, with the best cosmetic results. The third case was a recurrent round-celled sarcoma involving the inner side of the arm and the axilla, about the size of an apple, which showed some improvement after one week, as regarded pain. This patient was practically well after two months. The author gives practically no idea of his technique.

6. For the purpose of avoiding the secondary shadows from the soft parts, Haffner advises the use of pads of wood-wool, about one or two finger-breadths in thickness.

7. One of the cases reported by Riedl shows only a rudimentary femur, while the other shows no femur, but a peculiar shaped upper extremity of the tibia which resembles somewhat the upper extremity of the femur.

8. Koch and Sterzel describe a tube with two cathodes, one of which is rendered inactive.

9. Levy-Dorn's apparatus consists of a lead box in which the Roentgen tube is so placed that the rays can only pass through a diaphragm. This box can be placed in any position. Its advantages are its diaphragm and the protection it gives both the operator and the patient.

DEUTSCHE MEDICINISCHE WOCHENSCHRIFT

April 27, 1905

1. The Value of the Roentgen Rays in Surgery — Prof. Dr. J. von Miculicz, Breslau.
2. The Use of the Roentgen Rays in War — Surgeon-General Dr. Schjerning, Berlin.
3. The Achievements of the Roentgen Rays in Internal Medicine — Prof. Dr. Th. Rumpf, Bonn.
4. The Value of the Roentgen Rays in Obstetrics and Gynecology — Prof. Hermann Freund, Strassburg.
5. The Roentgen Rays in Dermatotherapy — Dr. H. E. Schmidt, Berlin.
6. On the Value of the Roentgen Rays in Pediatrics — Dr. Paul Reyher, Berlin.
7. The Roentgen Rays in Dentistry — Prof. Dr. W. D. Miller, Berlin.
8. The Roentgen Rays in Anatomy — Prof. Dr. Karl von Bardeleben, Jena.
9. The Development of the Technique of Roentgen Radiation — Dr. Max Levy-Dorn, Berlin.

1. The *Deutsche Med. Wochenschrift* devotes almost its entire number to a general consideration of the scientific and practical results originating from the application of the Roentgen rays in medicine.

Surgery. This branch has benefited more than any other; for some of its aspects the Roentgen rays mean the beginning of a new epoch. They have become the means to refine and elucidate the diagnosis of processes well known before, e. g., of some fractures, some diseases of the bones and joints, foreign bodies, calculi. They have made us acquainted with pathological processes unknown or imperfectly known before, e. g., the isolated fractures of single bones of the wrist, as naviculare, the fractures and infractions of the foot after fatiguing marches, certain forms of fracture of the vertebræ, the very first beginnings of tuberculosis of the joints, congenital luxation of the hip; even the typical fracture of the radius, one of the most frequent and best known injuries, has been made better understood through the Roentgen picture. They have had, by improving diagnosis, a decided influence upon the treatment of surgical diseases. Miculicz also proposes a uniform nomenclature: Roentgography — Roentgen photography; Roentgogram — Roentgen photogram; Roentgoscopy — Production of images by means of Roentgen rays upon the fluorescing screen; Roentgenize — radiation by means of Roentgen rays for therapeutic purposes.

Going more into details he first mentions fracture and luxation. The Roentgogram in some instances only corroborates the diagnosis, while in others it reveals details which could not be established by other means, e. g., whether transverse or oblique or spiral in fractures of thigh and leg. Still more important is the Roentgogram for those fractures which occur in parts of the skeleton not easily accessible, e. g., the spinal column, the pelvis, the neck of the femur, or such bony parts which because of the immediate neighborhood of joints do not produce diagnostically valuable functional deviations, for instance, abnormal mobility.

The value of the Roentgogram, however, is not confined to the examination and diagnosis of a recent fracture; it is also employed for controlling the treatment instituted, and by means of the fluorescent screen the position of the fragments can be observed or changed while the dressing is put on. In compound fractures the Roentgen rays are also valuable, especially in gunshot fractures, because the manner of the bone injury is here much more varied than in the subcutaneous fractures and is seldom diagnosed with certainty, for instance, in cases with scattered bony splinters.

In cases of luxation roentgography is not of the same importance as in fractures; but it should never be omitted because some complications can thus be early recognized.

In congenital luxation of the hip the roentgogram not only verifies the diagnosis of luxation, but it shows whether the bony component parts of the joint, head, neck, and acetabulum are well formed or arrested in development. Later on the reposition and fixation and the gradual improvement can be roentgographically observed.

Concerning the diseases of the bones and joints the changes in the roentgogram are not always so striking as to be discernible to the layman, and the first stages are often recognized by the expert only.

The study of the juvenile skeleton, especially in the first years of life, gave new and surprising pictures. The gradual growth of the bony structures of the epiphyses, gives, in the picture, such peculiar outlines that one at first glance thinks of a pathological process. For these reasons it seems advisable to compare the healthy and the diseased side,

or in diseases affecting both sides or in those of the spine, the skull, and the pelvis, to compare with pictures of other persons of about the same age.

The Roentgen rays have increased our knowledge of tuberculosis of the bones and joints; the first stages of the process in bone, the changes due to treatment, the presence of large sequesters, the differential diagnosis between tuberculosis and other affections (e. g., coxitis tuberculosa-coxa vara; omarthritis rheumatica chronica-tuberculosa).

For the diagnosis of acute osteomyelitis roentgography is not of much value, but is very important in chronic cases.

In tertiary syphilis of bones and joints we frequently see good pictures, but seldom characteristic enough to distinguish between syphilis and tuberculosis, osteomyelitis, malignant tumor.

The roentgogram is very characteristic in arthritis deformans, arthropathia tabica, syringomyelia, neoplasms of the bones, rachitis and osteomalacia.

Of the calculi that can be demonstrated by the Roentgen rays the stones of the bladder, the ureter, and the renal pelvis deserve first mention. They all give a shadow although of different intensity according to their chemical composition, their size and thickness, and the thickness of the covering soft parts. The latter obstacle is lessened, though not excluded, by the Albers-Schönberg Blende. Larger stones of the bladder, especially in children and thin adults, give very clear shadows, while stones of the ureter and smaller stones of the renal pelvis in stout persons give only weak, indistinct shadows, or, under unfavorable circumstances, are not distinguished at all. Scybala may also deceive and a diagnostic value can be attributed to a shadow in the neighborhood of kidney or ureter only after several exposures; made at different times and in different directions, with bowels evacuated, show a certain constancy in shape and size.

In biliary calculi roentgography is of no practical consequence as yet, the chemical composition of the majority of these stones — cholesterin — does not admit of their detection in the roentgen picture. Fortunately the certainty of the presence of gallstones is not of the same importance to the surgeon as is that of urinary calculi, for the presence of gallstones *per se* will be no indication for surgical interference, only in combination with certain disturbances which can be clinically demonstrated without the Roentgen rays.

Therapeutic Use. The rays have an electric effect and in the first place destroy the carcinoma cells. Unfortunately the intensity of their effect is inversely proportional to the thickness of the radiated tissues, consequently superficial carcinomata only can be successfully treated. Thus Roentgen therapy is limited. It is far superior to the knife in skin cancers in the neighborhood of the eyelids and the nose and at all places where, after a thorough excision, the defect would have to be covered by a special plastic operation. In deeper seated carcinomas and in superficial carcinomas reaching its deeper layers Roentgen therapy is employed when the cases are inoperable. In such cases, after the destruction of the superficial parts, we frequently see such startling and lasting improvements that the patient may, for a time, consider himself cured.

The combination of bloody operation and Roentgen treatment seems to deserve more attention than at present is paid to it. Sarcoma seems more refractory to the Roentgen rays than carcinoma, although some authors report cures.

2. There is nobody who would want to do without a Roentgen apparatus in modern warfare. Although the times are past when it was customary to extract every bullet and to search for it with probes and fingers, the military surgeon nevertheless will frequently have to remove foreign bodies, e. g., in cases where after a gunshot wound disturb-

ances of the nervous system, paralysis, irritation, or neuralgia remain, produced and kept up by the foreign body pressing against the brain, the spinal cord or a peripheral nerve, or in those numerous injuries caused by artillery projectiles in which dirty pieces of clothing or soil have penetrated into the deeper tissues, producing an infection and necessitating their removal. The Roentgen rays show the presence and the position of the foreign body and enable the surgeon gently to remove it.

Still more valuable are the rays for the diagnosis, prognosis, and therapy of bone injuries. They show the direction of the fragment lines, the size of the shattered hole, the extent of the zone of splintered fragments, the relation of the splinters to the soft parts, to the periosteum, their size and position. They teach us how to adapt the fractured ends, they show us pieces of dead bone which must be removed, they inform us whether scattered splinters can be left in the body without detriment to the neighboring tissues or to the functional mobility of the joints.

The author describes the new Roentgen apparatus used in the German army. The apparatus is built by Siemens and Halske. It contains a benzine motor, a dynamo, an inductor (coil) of 45 cm. (18 inches) spark length, a Wehnelt interrupter, a switchboard with a rheostat for the use of an outside electric source (direct or alternating) up to 220 volts tension, a voltmeter, an ammeter, a cable which permits placing the motor at a distance of 40 meters (130 feet), a kryptoscope (fluorescope), a tube stand, six Roentgen tubes with regulating device, all utensils for negative and positive process (plates, trays, washing trays, dry rack, ruby lamps for candles and electric light, chemicals, printing frames, paper, etc.), a search light and bull's eye lanterns for the illumination of the operating table and room, and a plentiful supply of tools and duplicates for all those parts which are subject to wear.

3. The skeleton is the most convincing object of the Roentgen examination. The rays are of extraordinary value in diseases of the spinal column. Aside from fractures and luxations, tubercular diseases of the vertebræ, stiffening as a consequence of ossifications, osteoporosis can be demonstrated on the plate. The Roentgen examination is of especial importance in cases where patients after accidents complain of pain, shortness of breath, and palpitation of the heart; hidden fractures of ribs with thickening of the underlying parts have been frequently found. Gout and arthritis deformans can be differentiated. It has been shown that abscess and gangrene of the lungs, bronchiectasis and cavities can be best localized by Roentgen pictures, taken in different diameters, or by stereoscopic Roentgen pictures. Echinococcus of the lungs has been demonstrated after other methods had failed.

A thickening of the pleuræ or a condensation of the lungs cannot very well be diagnosed by means of the rays alone, but they are helpful in combination with other methods. Of especial interest not only for the lungs, but also for the heart is the Roentgen examination of the diaphragm, giving different pictures in tuberculosis incipiens, pleurisy, pneumothorax. Roentgen examination of the heart and the blood vessels has been of much service and promises to be more so in the future.

4. Roentgography can frequently be employed for the diagnosis of pregnancy, twin gestation, and ectopic gravidity, for acquiring information about the position of the fœtus, the mechanism of the birth, and the form and size of the pelvis. Anatomical changes in the maternal organism during pregnancy may be studied, e. g., the configuration of the diaphragm and the hypertrophy of the heart. In gynecology the application of the rays is limited; they may be used in detecting foreign bodies, calcifi-

cations, and concrements. The therapeutic application of the rays can be thought of only after their value has been proved beyond doubt.

5. After explaining the difference between "hard" and "soft" tubes the author shortly mentions the skin diseases in which the rays have been advantageously used; favus, sycosis, trichophytosis, hypertrichosis, dermatitis papillaris — also called acne-keloid, furunculosis, psoriasis, eczema, lichen ruber, hyperidrosis, lupus erythematodes and vulgaris, rhino-scleroma, ulcus rodens. "The Roentgen rays are today an indispensable agent in dermatotherapy and embrace a territory of application, the final limitation of which cannot at present be perceived."

6. Levy-Dorn gives a short but exhaustive description of the evolution of Roentgen technic. It is impossible to do this article justice in abstractive form. He concludes his article with the following words: "The basis of the Roentgen method is the tube. In its development is reflected that of the whole method. But without the invention and improvement of numerous devices and medical methods, both for examination and treatment, we would not have advanced to the present height. We may hope for more in the future."

MISCELLANEOUS ABSTRACTS

ELECTROTHERAPY

SOME REMARKS ON ELECTROSTATIC TREATMENT

J. C. Webb, *London Lancet,* June 10, 1905

Webb puts forward a strong plea for the more general use of the static current in the treatment of disease and states his belief that the static machine is capable of doing all, in a therapeutical way, that can be effected by the d'Arsonval equipment, and more. He is not at all convinced that the greater amperage involved in the d'Arsonval current exhibits any advantage over the small amperage of the static current.

He divides the physiological effects into local and general. Under the head of local he mentions:

"Removal of the effects of stasis, with absorption of plasma and detritus, thereby lessening pain, and inducing reabsorption of fibrin, organic and inorganic salts — the results of defective metabolism. This is best brought about by the 'wave current,' which causes what I can most satisfactorily describe as a 'histological massage.'"

He expresses faith in the influence of the ozone developed by applying the static current through vacuum electrodes, and has had most satisfactory results in the treatment of hemorrhoids and fissures by the use of these electrodes. Other diseases in which he recommends its use are all inflammations not due to microbic origin or mechanical pressure, congestion of the liver with constipation, chronic inflamed joints, inflammations of nerves or their sheaths, ulcers, and some skin diseases. Chronic catarrh of the vocal cords, leading to hoarseness, will yield readily to the various modifications of the static current. He regards it as the remedy par excellence for all cases of neurasthenia or brain fag.

STATIC ELECTRICAL TREATMENT OF NEURASTHENIA

R. W. Miller, *Virginia Medical Semi-Monthly,* June 9, 1905

Resulting as neurasthenia does from an impaired metabolism, thus producing waste products, which substances effect an auto-intoxication by reason of the circulation of such products in the blood current, we find present, first, nerve weakness; second, nerve irritability.

From this weakness and irritability of the nervous system we might well expect anemia, indigestion, precordial pain, irregular action of the heart, in short, disorganized conditions of the secretory and excretory organs associated with hysteria or hypochondriasis. Scarcely any treatment will meet as many of these symptoms as static electricity: 1. It controls local congestion. 2. It relieves pain. 3. It quiets irritated nerves. 4. It grants peaceful and natural sleep. 5. It favors general functional activity. In brief, it is a counter-irritant, sedative, hypnotic, narcotic, and general tonic.

For general treatment, Miller usually employs the Morton wave current. The patient is placed upon an insulated platform, the negative pole grounded, and the positive pole, terminating in a zinc plate or tinsel braid; is bound upon the bare skin of the patient, the point selected being dependent upon the part giving the most prominent symptoms. The machine is then started and the spark gap opened from 1 to 4 inches according to the condition of the atmosphere, speed of the machine, diameter of the plates, physical characteristics of the patient, etc. Usually, this treatment is continued 20 to 30 minutes daily.

As a result we find: 1. Metabolism stimulated. 2. Improved nutritive functions. 3. Elimination of objectionable accumulations. 4. Sleep. 5. Increase of weight.

As evidence of increased glandular activity and electrical benefits, it is interesting to note that following the general treatment, the sweat glands, which in neurasthenia are more or less inactive, have after 5 or 6 treatments, their functions re-established. The nearer the return to normal of these glands, the better the whole condition — better sleep, better appetite, better nerve tone.

Should insomnia persist in spite of the general treatment, it is well to have two sittings per day, one in the early morning hours, the other at night before retiring. In giving this, a 9 or 10-inch plate may be placed over the abdomen and treatment continued for 30 minutes. As a rule, conditions favorable to sleep, i. e., general relaxation, lowered arterial tension, lessened nervous irritability, result.

An unsatisfactory peripheral circulation, if not improved by general treatment may be greatly stimulated through the application of friction sparks over the entire body, using for the purpose a large ball electrode or good metallic brush.

Special treatment may also be used in obstinate constipation. The bowel atony due to diminished nerve tone, causing loss of secretory and excretory functions, may respond splendidly to the undulating current, which consists of a current starting at zero and gradually increased until the maximum of strength is produced, then returning to zero. Twenty minutes of this to-and-fro treatment will produce a change in muscular action through this wave-like contraction and relaxation. Exhaustion of muscle cannot occur, because the maximum contractions are of the very shortest duration.

A NEW ELECTRO-CYSTOSCOPE

W. H. Otis, *London Lancet,* June 10, 1905

See illustrated abstract in the ARCHIVES for July, 1905.

HIGH FREQUENCY IN INSOMNIA

W. F. Somerville, *Illinois Medical Journal*, June, 1905

Somerville has had most gratifying results in insomnia from the application of high-frequency currents by means of the condenser couch and the use of M. Gaiffe's new high-frequency installation with which large amperages may be applied. He uses amperages up to 850 ma., and considers that failure to produce the hypnotic effect may follow the use of the ordinarily-employed amperages (200 to 400 ma.). The effect of the treatment is not as immediately apparent as is that of a dose of trional, it usually being necessary to give from 12 to 50 applications before satisfactory results are secured, but the patient usually begins to sleep more or less at once and steadily improves until normal sleep is procured. He considers it probable that an anemia of the brain is produced inversely proportional to the dilatation effected in the peripheral circulation. He reports several cases which illustrate this action of the high-frequency current and states that he has never seen any evil result follow.

THE TREATMENT OF ARTERIOSCLEROSIS BY MEANS OF D'ARSONVALISATION

Dr. Moutier, *Zeitschrift für Elektrotherapie*, Bd. 7, Heft 2, 1905

In the beginning of his experiments with d'Arsonvalisation Moutier could see at once a marked improvement in the conditions of patients with increased arterial pressure. But there was no criterion to prove that the subjective improvement of the patient had also been an objective one. That has changed now.

In 1902 the author modified his apparatus in the following manner: Equal spiral, interrupter (Contremoulins-Gaiffe), petroleum condenser, and solenoid. "From now on the results are beyond a doubt." In order to treat the patient at his home, he constructed a portable apparatus with storage cells, etc., which gave him the same good results as the older one, viz.: in the first sitting within a few minutes the blood pressure of the patient was diminished to 3, 4, 5, and even 6 centimeters Hg., which can easily be proved by means of the sphygmograph or sphygmomanometer.

In persons with normal blood pressure a diminution of the pressure after d'Arsonvalisation was never observed. The rapidity of that diminution does not seem to have anything to do with the gravity or duration of the disease, but rather with nutrition. Technically important are the duration of each sitting and the intervals. Moutier recommends 5 to 10 minutes for each seance, which should be repeated twice or three times a week.

FIBROID TUMORS OF THE UTERUS; THEIR SURGICAL TREATMENT

Franklin H. Martin, *N. Y. Med. Jour.* and *Phila. Med. Jour.*, June 17, 1905

The conclusions arrived at in this paper are based on an analysis of 1388 cases reported by different observers, including the author.

Martin has treated 200 cases by operation and 400 cases by less radical measures. He was the first in America to make scientific use of electricity for the treatment of fibroids and the first in any country to describe the treatment of vaginal ligation of the base of the broad ligament, including the uterine arteries. He speaks of the use of galvanism in connection with this condition as follows:

"(*a*) It acts as a powerful general tonic; (*b*) relieves hæmorrhage in symmetrically developed fibroids with no submucous projections; (*c*) promptly re-

lieves neuralgic pains and frequently pressure symptoms; (*d*) many fibroids will grow smaller under treatment, others will remain stationary in their development, while a few, usually the unsymmetrical, will not be affected.

"These effects may be relied upon if the physician has the tact and perseverance to push the treatment, and the patient is willing to pursue a slow and at best an uncertain method of relief. I wish to say that with galvanism I have successfully tided many patients over the menopause who would have succumbed or become invalided without it, and have left them in perfect health symptomatically."

NON-SURGICAL TREATMENT OF THE DISEASES OF WOMEN

Curran Pope, *Alkaloidal Clinic,* June, 1905

The subject under discussion is amenorrhea, and under this term are grouped two conditions, namely scanty and true amenorrhea and suppressed menstruation. Amenorrhea is defined as an irregularly-appearing, deficient or suppressed menstrual flow, and the condition is found most frequently in young girls just entering the stage of puberty or during early womanhood. Besides the conditions typical of anemia it is accompanied by marked digestive disorders, and almost invariably with chronic constipation with its unfortunate concomitant of putrefactive intestinal changes.

The urine is found loaded with urates, uric acid, and oxalates. The specific gravity is high and with this the urea, chlorides, phosphates, and sulphates diminish upon quantitative test.

The diagnosis is usually clear and the treatment involves, besides ordinary hygienic rules with proper exercise, a plain nourishing diet with the free drinking of water between meals.

In conjunction with hydrotherapy, which ranks as the most important and most effective means of producing results, the author recommends the use of the electric light bath, and at the time when the period is expected, a hot sitz bath followed by a rest in bed, with hot applications, hot douches, etc.

The special value of massage in these cases lies in the effects that it produces upon the general health of the patient. Mechanical or vibratory massage are preferred by the author, who believes that the mechanical measures of massage and vibration are superior to the action of the human hand.

In the use of drugs, the bitter tonics with iron and arsenic, etc., are recommended.

Electrotherapy is the most valuable of all treatments, and the galvanic current is applied by placing a large felt-covered pad upon the lumbar region attached to the positive pole, and a similar pad attached to the negative pole, upon the abdominal wall, both pads having been moistened with hot bicarbonate of soda solution.

Spinal galvanization is administered by applying the first described pad, attached to the negative pole, upon the abdomen over the pelvis, the positive pole being attached to a three-inch round metal electrode covered with soft felt, which is placed upon the lumbar region of the cord. The spinal electrode is slowly moved from the occiput to the sacral region. A current of 20 to 30 ma. is sufficient for both these procedures.

Spinal galvanization, together with the high tension faradic current, proves of signal service in stimulating the general and local functions and is much preferable to spinal galvanization alone.

The static wave current may be given for periods of ten minutes with benefit.

Constipation is best overcome by the sinusoidal current with the rectal electrode in place. The abdominal electrode

is placed upon the abdomen and the current gradually turned on until muscular contractions are produced. The electrode is then moved with a gentle rotary movement over the entire abdominal wall so as to produce vigorous contractions of the lateral and anterior muscles.

In some instances much benefit comes from the use of Diefenbach's fluted high-frequency electrode introduced into the rectum, the high-frequency current being given for 5 or 10 minutes. In cases which refuse to yield to hygienic treatment, general tonics, and external methods in general, local treatments must be adopted.

The bipolar vaginal electrode, sterilized, warmed, and lubricated, is introduced deep under the uterus. The current should be gradually increased up to the point of toleration. The duration of the treatment should be from 5 to 10 minutes, reducing the current gradually.

If the uterus is infantile, flabby, or enlarged, the bipolar intrauterine electrode should be used. The treatment should range from five to ten minutes and from twenty to twenty-five treatments are usually necessary.

The most positive and certain method of securing results, however, is by means of intrauterine galvanism. A suitable intrauterine electrode adaptable to the cervical opening is introduced and attached to the negative pole. The current may be increased from ten to fifteen ma. at the first treatments, and twenty to twenty-five ma. at a later stage. The duration of the treatment is three to five minutes. The action of this treatment is to cause a free flow of secretions; it opens the channel, secures free drainage, stimulates the nutrition in the uterine body, and increases the blood supply to this organ.

The treatment should be administered three times weekly and may be advantageously followed by the use of the bipolar high-tension faradic treatment, which removes any sense of fullness or discomfort and at the same time exerts a tonic and stimulating influence.

THE THERAPEUTIC EFFECT OF THE MAGNETIC FIELD

Dr. T. Krefft, *Berlin Klin. Woch.* May 29, 1905

Swiss electric engineers while working with alternating current magnets of very great strength accidentally found that the magnetic field allays pain and first made use of it in neuralgic and rheumatic affections. Eugene Konrad Müller constructed an electromagnet consisting of a laminated iron core with a copper wire bobbin around it, fed by an alternating current of a strength of from 10 to 30 amperes. The field of the electromagnet "system" Trüb, is not generated by an alternating current in a fixed iron core, but by a rotating horse shoe magnet fed by a direct current; this arrangement also produces an alternating field.

The electromagnetic therapy is indicated in a large number of painful organic and functional affections. Surprising results have especially been observed in old cases of neuralgia, rheumatic arthritis, even tabetic pains have been relieved. A favorable influence has been shown in neurasthenia, insomnia, nervous tachycardia, stenocardiac attacks, etc.

The electromagnetic therapy is distinguished by a total lack of any undesired concomitant effects such as have been observed in other methods of physical therapy.

The author omits to mention the technic of application, duration, etc.

THE SKIAGRAPHY OF THE FUTURE

J. Rudis-Jicinsky, *Med. Jour.* and *Phila. Med. Jour.*, May 13, 1905.

If we succeed in obviating the diffused rays throughout the tissue which is interposed between the tube and the sensitized plate, we will get not only a clear picture, with sharp contrast, but pictures altogether different from others made thus far. For this purpose the author uses a "protector" with a funnel-shaped cylinder and specula. He directs that the tube should be covered with the protector containing the lead foil and covered on the outside with papier mâché, and the diaphragm or opening selected to suit each individual case. He uses the funnel arrangement to concentrate the rays. The apparatus can be used for both skiagraphy and radiotherapy, and is a home-made device. The shield is attached to the tube by bands, and can be moved with the tube in any direction.

PROTECTION FROM ROENTGEN RAY INJURIES

Charles L. Leonard, *Jour. A. M. A.*, May 6, 1905

Leonard calls attention to the serious risk that X-ray operators undergo, especially if they follow the practice advised of testing the qualities of the rays on their hands with the fluorescent screen. The only practical method is to limit the field radiated by covering the Crooke's tube. For this purpose he uses a pasteboard box a little wider than the diameter of the tube and covered with X-ray lead foil a little heavier than the ordinary tea lead. This extends two inches below the bottom of the box, and can be adjusted so as to limit the field of influence as required. It is not necessary to cover the anode end, and the box is held on a bracket over the portion of the body to be treated; if a very small field is required, a local shield may also be employed. He thinks possibly some effects are due to the strong induction field surrounding the coil which, especially in large hospitals, should be kept in another room, but with the controlling apparatus within the operator's reach. For the dermatitis of the operator's hands, he advises soaking twice daily, in very warm water and scrubbing with Eichhoff's superfatted resorcin soap, followed by inunction of lanolin containing half an ounce of boric acid and a dram of resorcin to the ounce. For the acute erythema of X-ray treatment, he employs a stearate of zinc powder with ten per cent. ichthyol, which he thinks acts as a prophylactic against severe burns. This should not be confused with stearate of zinc ointment, which may do harm.

FORTY CASES OF URETERAL CALCULUS IN WHICH THE ROENTGEN DIAGNOSIS WAS CONFIRMED BY THE RECOVERY OF THE CALCULUS

Charles Lester Leonard, *London Lancet*, June 17, 1905

This paper sets forth at some length the significance of the clinical symptomatology of renal and ureteral calculus as regards the proper line of treatment, medicinal or surgical, to be pursued in an individual case.

As regards the Roentgen ray aspect of the paper Leonard's series of 330 examinations has shown that ureteral calculi are very much more common than was formerly supposed; their ratio to renal stones, as thus indicated in this series, being 33 to 66, including cases not operated upon nor confirmed by the passage of the calculi, and 29 to 40 in cases confirmed by operation or the passage of the calculi. The Roentgen diagnosis has been of great value in leading to the

recognition of and closer differentiation between the symptoms of renal and ureteral colic whereby the choice of treatment, immediately operative or expectant, has been much facilitated. Leonard has had 40 cases in which the Roentgen diagnosis of the ureteral stone has been confirmed by operative removal or spontaneous passage of the calculi. The diagnosis of ureteral rather than renal stone cannot be positively made by any other method.

Leonard claims that the negative diagnosis is reliable and that there have occurred "but four cases in which calculi have been found on operation or passed in the series of 330 cases examined since I claimed equal accuracy for the negative and positive diagnosis, and the negative diagnosis has been confirmed by operation 47 times. There have been six other cases in which the surgeon failed to find a small calculus detected by the Roentgen ray or in which only a mass of cretaceous substance was found in the pelvis of the kidney. It is probable that half the errors were due to defective operating, a delay after the examination sufficient for the calculus to pass, or its escape during the operation."

The value of an accurate negative diagnosis is, of course, very great as, if reliable, it renders unnecessary exploratory or any other operation, indications for which might be deduced from the clinical phenomena. It is very necessary, however, that a man be possessed of the utmost skill in Roentgenography in order that his diagnosis may be depended upon, and Leonard considers that the following features of his technique are essential for the attainment of reliability.

"The first essential of technique is the employment of a constant quality of Roentgen ray, the penetrating power of which is so low that it will not penetrate the least dense calculi. The negative diagnosis was established upon the axiom that where shadows of tissues less dense than the least dense calculus are shown no calculus should escape detection.

"The recognition of a negative as possessing these qualities and its proper translation are essentials of technique. The quality of ray employed has been given off by a tube, the relative resistance of which, as measured by a parallel spark in air, was from one and a half to two inches. The tube must be capable of maintaining itself during the entire exposure at the same vacuum. Many tubes and tubes of higher vacuum often vary in penetrating power, so that the light at one time during the exposure penetrates the smaller calculi. A technique based upon short exposures and a higher vacuum is open to this defect. The majority of tubes vary in vacua decidedly during an exposure, as can be demonstrated by photo-chemic tests, or seen in the reading of the milliamperemeter in series with the tube in the secondary circuit, or as noted in the parallel spark gap. The employment of a compression diaphragm is unnecessary unless tubes are energized by coils working on high voltage circuits in which a high amount of inverse discharge results from an improperly corrected self-induction. I have always employed 20 volts or less in my apparatus, and I believe that the absence of diffuse radiations results from the employment of higher voltages."

PRINCIPLES GOVERNING THE TECHNIC OF ROENTGEN RAY THERAPY

Ennion G. Williams, *Medical News*, May 13, 1905

The writer claims that the variations in the results following the application of the X-ray for therapeutic purposes are due to the differences of technic and variations in the apparatus. The application of the ray should be based upon

its physical laws and its action upon living tissue. A tube of low resistance gives off more energy and a greater proportion of this is absorbed in the tissues. The low tube gives off a large quantity of rays of small penetration and low velocity, while a high tube gives off a small quantity of rays of high penetration and velocity, thus, though the energy emitted may be the same in each case the physiological working power varies. The physiological action of the rays is manifested upon the vital principles of the cells. There occurs first stimulation followed by cessation of vital activities. The cells die, are absorbed or cast off, and in so doing excite inflammatory changes in the tissues. Those cells most active functionally, most readily succumb to the destructive influence of the ray. They are more complex, hence more readily disturbed.

Tissues are acted upon in proportion to cellular activity, hence the selective affinity of the ray for malignant growths composed of very active cells. Very small doses of the X-ray are stimulants. Each operator should determine by experiment, the length of time required under fixed conditions to produce a reddening of the normal skin. Since the results of a given exposure do not appear for days after, no larger doses than necessary to produce redness, should be given during ten days, unless necrosis is desired. Series of treatments with intervals of several days should be given, and the sum total of such treatments should equal that necessary to produce the desired effect; this sum total should be administered in several treatments.

Idiosyncrasy is a factor demanding recognition, although often held responsible for idiosyncrasies of the operator. For bactericidal effect sufficient dosage to destroy bacteria must be given in single exposures, otherwise the bacteria regain vitality between exposures, hence lupus patches should be given prolonged exposures.

Unexplained questions are the cause of the anodyne effect of the X-ray; the proportion of the effectiveness of the ray lost by absorption in or in penetrating the tissues; the reason why a few layers of gauze, the resistance of which to the ray is hardly perceptible on the fluoroscopic screen, should diminish so markedly the effect upon the skin and also the bactericidal effect; is the X-ray made up of rays of different physiological action?

RADIOTHERAPY

THE PRESENT STATUS OF ROENTGEN RAY THERAPY

Russell H. Boggs, *Medical Record,* May 6, 1905

Physicians at large have no idea of the curative possibilities of the Roentgen ray, but this agent has, even with the imperfect technique available at the present time, attained a therapeutical position equal in importance to that of antitoxin or vaccination.

A correct judgment of the character of the ray to be applied to a given case is the keynote to success; and ability to select the tube which will produce radiations of proper volume and penetration, is a most important element in the making up of a successful radiotherapeutist. X-ray meters are of a certain amount of value, but are not nearly as reliable in defining a given ray as they are claimed to be by the manufacturers.

Because of the dangers dependent upon constant and repeated exposures to the X-ray and the very limited field

of usefulness which it occupies, the use of the fluoroscope is to be condemned. The X-rays are dangerous, as are also cutting instruments, strychnia, etc., if carelessly handled, but this is no argument against their use; it is only an argument against allowing carelessness to have any place in the practice of medicine.

A strong plea is made for the post-operative use of the X-ray in carcinoma. Of tubercular diseases those affecting lymphatic glands and fistulæ are most benefited, and bone lesions are the least benefited. Even pulmonary tuberculosis is more responsive to the X-ray than tuberculosis of bone. The treatment of tuberculosis, when combined with streptococcic infection, is not satisfactory as a rule, although Burdick has reported good results in such cases by combining anti-streptococcic serum with the X-ray. In acne, eczema, psoriasis, keloid, nevus, lupus vulgaris, and erythematosus, mycosis fungoides, sycosis, and some other skin lesions, the Roentgen ray is accorded the first place as a therapeutic agent, and accomplishes results that cannot be attained by any other agent.

Boggs draws the following conclusions:

"First, that the wide difference of opinion as to the value of the rays is largely due to the manner in which they are applied.

"Second, that if the best interests of our patients are to be considered, the rays must be given a place as a therapeutic agent.

"Third, that injury to operators from the rays during the past two years, has been due to thoughtlessness or lack of familiarity with what is going on in the X-ray world.

"Fourth, that in applying the rays it is essential to know the quality as well as the quantity of the rays absorbed, and that this must be varied to suit each individual case.

"Fifth, that unless the operator has had a wide experience in the treatment of carcinoma, he should always consult a surgeon in each case, as it is certainly by the combination of surgery and the X-ray that the best results are to be obtained."

MALIGNANT DISEASE OF THE FUNDUS UTERI, TREATED BY X-RAYS THROUGH THE ABDOMINAL WALL; RECOVERY

Arthur J. Cleveland and Donald D. Day, *British Medical Journal,* April 29, 1905

The patient was first seen by Mr. Day October 6, 1903, who describes her condition at that time as follows: "She was in a state of great debility and anæmia induced by frequent uterine hemorrhages. The uterus was somewhat enlarged, and the fundus could easily be felt bulging to the left and tender to pressure. *Per vaginum* the uterus felt fixed, especially on the left side; the cervix was patulous, and a probe passed 4 in. A diagnosis of carcinoma of the body of the uterus was made."

A laparotomy was done at the Norfolk and Norwich Hospital on November 9th, but the growth, which was the size of a small orange and irregular in outline, had so extensively involved the left broad ligament, the sigmoid flexure, and the pelvic wall that removal was out of the question, and the abdomen was closed without anything else having been done. No doubt remained in the minds of those who were present at the operation as to the malignancy of the growth, but no microscopical examination was made.

On December 12, 1903, Dr. Cleveland began applying X-rays from a moderately high tube, placed 6 inches distant from the skin over the abdomen and excited by a mica-plate static machine, seances lasting fifteen minutes, three times a week. The tube was placed di-

rectly over the pelvis and the rays reached the uterus *through the abdominal wall.*

Thirteen treatments, distributed over a period of about a month, produced a sharp dermatitis and the applications were discontinued for a month. Twelve more applications were then given, which again produced dermatitis and they were again stopped. At this time marked improvement was manifest, she was sleeping well, and could walk two or three miles without pain, and had gained several pounds in weight. After a month's intermission a few more treatments were given, improvement still continuing, and on June 4, 1904, or six months after X-radiation was inaugurated, she was again examined by Mr. Day, who "found the uterus of normal size and freely movable. No sign of disease existing in it or the broad ligament could be discovered and she was apparently completely recovered. I consider that the entire credit for this must be ascribed to the X-ray treatment."

Since then the patient has been as well as she ever was in her life, menstruation entirely normal, no discharge from either vagina or uterus, and she has just started for India, conditions which speak for themselves as far as the inherent power of the X-ray to influence deeply-located cancer through sound tissues is concerned.

X-RAY TREATMENT OF CANCER

E. G. Williams, *Jour. A. M. A.*, May 6, 1905

The microscopic changes in the tissues should be our guide as to the therapeutic possibilities in the X-ray treatment of malignant growths. It is evident, he states, that the elements of the tissues are affected according to their vitality. Dead organic matter is unaffected, and the more active the growth the greater the effect. Next to this is the accessibility of the tissues to the rays. Hence the better results with superficial or skin cancers. That moderately deep tissues can be affected is shown by experience, and the way to reach them without producing necrosis of overlying tissues is to lengthen the distance of the tube from the part under treatment, and the time of exposure. For deep growths, radical surgical measures should be recommended, as the patient should be given the benefit of the probability rather than the possibility of good results. In such cases, however, operation might be rationally followed by X-ray treatment to destroy what may remain of the malignant growth. Inoperable cases should be treated by the X-ray because remarkable results have been obtained and the most distressing symptom of pain relieved.

TREATMENT OF NON-MALIGNANT DISEASES BY THE ROENTGEN RAY

Russell H. Boggs, *Medical News*, May 6, 1905

Attention is called to the frequency with which syphilitic conditions are misdiagnosticated as lupus, which interferes seriously with the reliability of the present statistics of X-ray therapy. The X-ray, of course, will not cure syphilis. See also abstract of another article by the same author, on page 154 of THE ARCHIVES for April, 1905.

PAGET'S DISEASE (?) OF THE GLUTEAL REGION: THE EFFECTS OF THE ROENTGEN RAYS UPON THE DISEASE

John A. Fordyce, *Journal of Cutaneous Diseases*, May, 1905

It is still an undecided question as to whether or not malignant proliferation of the epidermis constitutes an essential

factor in the pathology of Paget's disease. Fordyce's investigations would indicate that it did not. The chief interest connected with the affection is its association, in the majority of cases, with carcinoma of the glandular structure of the breast. Aside from this association, however, the skin changes are so definitely constant that the nature of the affection in general is recognizable before the mammary tumor develops.

He reports a case of Paget's disease of the gluteal region occurring in a woman 60 years old, following an injury about seven years previously. A year after the injury she noticed a dark red spot located where the contusion had taken place, which slowly increased in size, was sometimes somewhat painful, but never gave rise to a pronounced discharge. It bled on slight provocation, however, and she was always conscious of its presence.

When she came under Fordyce's care the lesion was about three inches in diameter, irregularly rounded, flat, and dark red in color, with sharply-defined outlines. Epidermic exfoliation was present except in the center, where an area three-quarters of an inch wide was eroded, nodular, and bled at slight irritation. Numerous microscopical examinations were made of sections taken from the periphery to the center of the lesion before, during, and after treatment by the Roentgen ray, and the histology of the case carefully studied.

She received ten X-ray exposures a week apart, averaging ten minutes each, anode from 4 to 6 inches from the affected area, which produced pronounced reaction after seven sittings. During this time the lesion apparently became larger, grew painful, discharged pus freely, and the ray was discontinued under the impression that it was doing the patient harm. During the month following cessation of treatment, however, and during which time the sore was dressed with aristol, the lesion completely healed, leaving a smooth scar, which showed only slight thickening in the regions from whence the sections for microscopical examinations had been taken. The histological findings are reported and illustrated in full.

Fordyce considers that cases of this sort may be classified as transitional forms between some of the less common types of superficial epitheliomata and the well-known pre-cancerous condition of the breast.

RECENT ADVANCES IN DERMATOLOGY

J. M. H. McLeod, *London Practitioner*, May, 1905

During the course of this article McLeod states his belief that the X-ray promises to supersede all previous methods for the treatment of widely-disseminated ring-worm of the scalp. A complete defluvium may be produced by a single sitting and during the three weeks following every diseased hair will have fallen out and the child cease to be infectious. The only other treatment required in connection with the X-ray is the application of tonic lotions and the keeping of the scalp healthy and clean by washing daily and rubbing in some anti-parasitic ointment.

The technique is as yet far from perfect, but he recommends the following:

Crop the hair short and if there are only a few patches of ring-worm on the scalp cut holes in a sheet of lead foil, sufficient in number and of appropriate size to expose the diseased areas and protect the sound scalp; each hole should be large enough to leave about one cm. outside the disease area exposed to the rays. If the disease be widely disseminated the scalp may be divided up into four areas, viz: the crown, parietal regions, and the occiput, and these should be exposed *seriatum*, great care being

taken not to expose even the borders of the same area twice. The hairs begin to fall out about the fifteenth day; if they do not then begin to fall out, as sometimes happens from insufficient exposure or idiosyncrasy on the part of the patient, a second exposure should be given on the twenty-first day, and if necessary a third exposure after three weeks more. This result is secured without any reaction except a slight transient erythema which frequently appears about a week after the exposure. The healthy hairs begin to grow in again about six weeks after they have fallen out, and have usually completely returned in three months.

The exposures are made with a tube backing up a spark-gap of about three inches, and last about 16 minutes, anode about 15 cm. from the scalp.

The rays do not kill the fungus.

THE PRESENT STATUS OF ROENTGEN RAY THERAPY IN DERMATOLOGY

Julius M. Comroe, *American Medicine*, June, 1905

Comroe believes most cutaneous diseases depend upon, first, some exciting micro-organism or local pathological process, and second, metabolic changes in the skin, the result of some remote systemic condition. The pathologic action of the ray is exerted upon the skin and underlying structures. The intima of the blood vessels undergoes a form of degeneration similar to an endarteritis obliterans, following which diseased tissue is starved out. He summarizes the views of several authors as follows: The first stage almost invariably leads to necrosis of cells (the nuclei and protoplasm undergoing lysis). In many cases, however, the process progresses to fatty degeneration and increased elastic tissue formation and there is a tendency toward the occlusion of the blood vessels by deposit on the intima. This he terms the destructive stage.

During the second stage is observed stimulation of the connective tissue elements, leading to the filling up of cavities and the formation of healthy scar tissue. This is designated the reparative stage.

Of 339 cases of epithelioma reported by Pfahler, Geo. C. Johnston, Schamburg, and others, 64 per cent. were cured, 30 per cent. improved, 6 per cent. not improved. The average number of treatments is 27, the average time, 8 weeks. Experience has shown that in unfavorable cases an ante-operative course of treatment, followed by operation and post-operative radiation, uniformly yields the best results. He advises daily radiation with high vacuum tube, for 5 to 10 minutes, the treatments every third day, the tube at about 8 inches distance, until a mild dermatitis occurs, following which treatment is interrupted for 2 to 3 weeks awaiting the reparative effect. If the ray be used continuously, without interval, the condition may be aggravated. The healthy tissue is protected by lead foil.

Epitheliomas about the mouth are difficult to treat and unsatisfactory. On the other hand those about the borders of the eyelids, alae of the nose, etc., are very satisfactory. Deep seated epitheliomas in which cartilage or bone are exposed, do well at first, but soon become much worse. He classes radiotherapy in epithelioma as safe, convenient, painless, giving the best cosmetic results, and followed less frequently by recurrence.

In rodent ulcer the results are very good. Pfahler has collected 90 cases, 49 per cent. cured, the remainder still under treatment and improved. Recurrence is infrequent and amenable.

In lupus vulgaris, he collected 97 cases, showing 85 per cent. cured, with an average number of 38 treatments in an average time of 9 weeks. Lupus ery-

thematosus has not yielded as good results. In acne radiotherapy has produced more good results than any other form of treatment, but it should be restricted to the intractable cases on account of the danger of producing a burn or causing atrophy of the skin. Pfahler has reported 50 cases with a high percentage of cures, and the remainder benefited. Treatment should be continued until a slight erythema is noted. The ultimate cosmetic effects are most gratifying. In chronic circumscribed eczema, the itching is relieved and the redness disappears. A soft tube is employed and treatment carried on to a beginning reaction.

Psoriasis is not so tractable under X-ray, but quite a number of cures have been reported. Sycosis yields to radiotherapy, but recurrences are rather frequent. In the treatment of pruritis ani, the results are almost uniformly successful, but the genitals should be well protected, lest aspermia follow.

X-ray burns must be carefully guarded against. They are not caused by platinum thrown off from the tube, neither are they caused by the static field surrounding the tube, but are probably tropho-neurotic in origin. Pathologically they are similar to sunburn. Idiosyncrasy plays a variable part. As a rule fair skins are more sensitive. The mucous membranes of the lips are very sensitive, and those of the mouth and conjunctiva least so.

The treatment of burns is obstinate. The first measure is discontinuance of the exposures, then an application of a 25 per cent. ointment of orthoform. The most effectual means of protection for the operator are hoods for the tube and isolation of the coil. He concludes:

First. Radiotherapy must not be considered a panacea. Although it has a large field of usefulness, it also has its limitations and dangers.

Second. Most constantly good results are obtained in epithelioma, rodent ulcer, and acne.

Third. Great benefit may be looked for in eczema, chiefly the vesicular variety affecting the hands, sycosis, tinea tonsurans, verruca, lichen planus, nevuses, and port wine marks, localizing pruritis, favus, etc.

Fourth. Deep-seated epitheliomas, with exposure of bone, cartilage, etc., appear to do well for awhile, but usually get worse eventually. The judicious combination of radiotherapy and operation is highly recommended in these cases.

Fifth. The Roentgen rays are beneficial when pain is particularly to be avoided, as in old, feeble people.

Sixth. Radiotherapy produces the best cosmetic results.

Seventh. Recurrence after radiotherapy is less frequent than after other methods, and more amenable to reapplication of the rays.

Eighth. The *high vacuum* tube is preferable in epithelioma, rodent ulcer, and lupus, the medium or soft tube being employed in other cases.

Ninth. Radiotherapeutic treatment should be instituted as soon as possible, the result being usually in direct proportion to this factor.

Tenth. Epithelioma of the skin usually reacts better than that involving the mucous membranes.

Eleventh. Tampering with caustic and other irrational forms of treatment is to be condemned as measures preceding radiotherapy, since they undoubtedly unfavorably alter the prognosis in such cases.

Twelfth. No rule can be laid down for the prevention of burns, etc., hence the dosage must be carefully regulated in each individual case.

Thirteenth. No protective ointments, powders, etc., must remain on the part treated, since they may prohibit or lessen the effect of the rays by interfering with their passage.

THE COMPARATIVE VALUE OF SOME OF THE NEWER METHODS OF TREATMENT OF SKIN DISEASES.

H. R. Varney, *Journal of the Michigan Medical Society,* June, 1905

Varney considers the comparative value of the Roentgen ray, Finsen light, radium, and high-frequency current in dermatology. He believes these agents have each a distinct field, and that they accomplish results in chronic conditions where all other treatments have failed. A correct diagnosis prior to treatment is a necessity, and the statistics of results obtained by these methods have been questioned because of the inability of many operators to make such diagnosis correctly.

The light treatment is not a panacea, but cases not benefited are rare. The value of light as a therapeutic agent, has been known since early days, but the profession has been slow to recognize it.

Finsen was the first to exclude the damaging rays of the spectrum, and to prove that the curative effect resides in the chemical rays. A distinction must be made between the destructive action of light on cell tissue, and the limited reaction which produces a normal reparative process, and if satisfactory results are to be obtained, cases must be treated accordingly.

Finsen light produces a sterilization of the tissues; the X-ray does not. Both are stimulants, and produce a physiological inflammation, but if carried farther, cause destruction of the pathological tissue.

The treatment must be deep enough to affect all diseased tissue. A cumulative effect must be avoided. The investigations of Finsen were so carefully made that nothing has since surpassed them.

The most important change in apparatus is the Finsen-Reyn Lamp, which possesses all the power of penetration of the original, but covers a larger area. Most of the other lamps on account of inability to use large currents, improper focus, and faulty pressure produce a superficial reaction merely, which occurs before the deeper tissues have been affected. The Finsen apparatus is expensive in first cost, and in cost of operation demands constant attention during treatment, and the area treated is limited, yet it is the best treatment for lupus erythematosus, chronic eczema, and port wine marks, upon which the Roentgen ray in Varney's experience, has little effect. It is not dangerous to the patient or operator. The Roentgen ray is often applied to conditions that require light treatment because it is more rapid, penetrates more deeply, covers larger areas, is better adapted to ulcerative conditions, the application is more comfortable to the patient, treatment is less expensive and the apparatus may be used for other purposes, but its power for evil is far greater than that of the Finsen light.

The Roentgen ray has a gratifying effect upon the diseases of the hair and its follicles. In ring-worm and sycosis, a sufficient dose to cause falling of the hair, after which the area is painted with mild antiseptics, will cure the disease in one-third the time required by other methods. Many other skin diseases unaffected by Finsen light respond to X-ray.

The therapeutic possibilities of radium are decidedly limited. It has been greatly over-estimated, and is being discarded by dermatologists. High frequency has attracted dermatologists because of its assistance to the Roentgen ray and Finsen methods. It has a pronounced action upon sensory nerves, relieving itching and pain, and it produces an increased blood supply to the skin, promoting cell metabolism. Its field of usefulness is in the localized itching affections. In the destruction of warts, moles, and nevi, it can be used in place of the electric needle, an application

from a carbon point electrode for 3 to 10 minutes, causing the wart or mole to turn black and fall off, leaving no trace. There is no comparison between the methods outlined, and the older methods of treatment, excision, curetting, scraping, cautery, and caustics; they are painful, they leave objectionable scars, they do not reach all diseased tissues, and they expose new areas to infection.

The Finsen light is the safest of these methods, both to patient and operator; the original apparatus is superior to any modification; the Roentgen ray covers the largest field; radium and high frequency are of special assistance.

CAN X-RAYS BE USED HOMŒOPATHICALLY?

John P. Sutherland, *North American Journal of Homœopathy,* June, 1903

From a study of the lesions produced by excessive dosage of X-rays and a comparison therewith of the pathology of disease processes which have proven to be amenable to X-ray therapy, Sutherland concludes that the curative action of the X-ray is upon homœopathic principles; it cures in therapeutic dosage lesions of the same sort that it causes in excessive dosage. As substantiating such conclusions he reports that he has suffered during the past three years from dermatitis of the hands resulting from the use of formalin solutions. The trouble was of an eczematous nature and proved exceedingly obstinate to other remedies, but the X-ray removed it promptly and satisfactorily, and has done so every time the condition has obtained since.

He also reports a case of extensive cancer of the abdomen accompanied by great and constant pain, which necessitated the taking of large quantities of morphine daily. The case was hopeless as regarded operation. Treatments of from three to six minutes every day for a few days and then every other day, enabled the patient to sleep at night without any morphine suppositories. In 20 days patient did not require a suppository during 40 hours. After six weeks' treatment she went five days without a suppository. After this she only occasionally needed one. Six months after treatment was inaugurated the patient died, but for 70 days prior to her death it had not been necessary to use any drugs for the relief of pain. Post-mortem examination showed that the malignant tissue had almost entirely disappeared, and the original tumor had been replaced by an abscess some three inches in diameter. Rupture of this abscess into the intestine was responsible for collapse and death.

Sutherland expresses gratification at the anodyne influence exhibited and concludes his article as follows: "To be able to produce such therapeutic effects by an agent in whose pathogenesy may be found symptoms and conditions similar to the point of parallelism to the condition treated, is, I think, a matter of great satisfaction and encouragement to those who advocate the law of similars and practice in accordance with its principles."

THE PHARMACOLOGY AND THERAPEUTICS OF ICE

V. G. L. Fielden, *British Medical Journal*, June 10, 1905

The author divides the physiological effects of ice into, first, those which are superficial, local, and direct; and second, those which are deeply local or reflex.

The utilization of the first-named effects is illustrated when ice is applied to inflamed piles or prolapse of the rectum, or when it is used as a local anæsthetic. The result is diminution in the four cardinal symptoms of inflammation. "(*a*) The pain is relieved because the smaller amount of blood to and effusion into the part causes less tension upon the nerve terminals; (*b*) the heat, and (*c*) the redness, are lessened because of the contraction of the blood vessels; and (*d*) the swelling is prevented or decreased on account of the lessened blood supply with consequent diminution of the effusion."

If the inflammation has existed some time the application of ice may not relieve these symptoms because the constriction of the blood vessels dependent thereon may imprison the products of inflammation already present and prevent their being absorbed. In such a case heat is indicated instead of cold. It is considered necessary that a considerable interval of time should elapse between the heat thus followed by cold, whereby the tissues may have time to gradually become warm, as is illustrated in the treatment of frost bite; if heat is applied immediately to tissues greatly chilled moist gangrene may be produced.

The deep local or reflex effect is utilized when ice is applied over the chest in the treatment of pneumonia or to the abdominal wall for deeply local inflammatory processes. It is considered to produce its effect under these conditions by reason of the well-known fact that irritation of areas of the skin produces modifications of the blood supply of internal organs which are innervated from that segment of the cord from which also arises the nerve supply of the area of skin influenced. Such reflex actions and vasomotor modifications are considered to be the important, if not the sole factors in the production of the effects upon deep-seated organs, of counter irritation; the application of ice is considered to be solely a counter-irritant in this connection, its action being susceptible of such intensity as to produce blistering.

Applications of ice to the general surface of the body, as in hyperpyrexia, are considered to exercise their beneficial influence by a combination of heat abstraction and reflex influence upon the heat centers due to the stimulating influence of the cold upon the nerve endings in the skin.

Such conception of its influence constitutes a rational basis upon which to comprehend its applicability to various disease conditions, and the manner in which it produces its well-known beneficial effects. The various diseases in which it is of use are mentioned, among them being hemorrhage from the mouth, throat, and lungs, and thirst after abdominal operations, which is greatly relieved by the taking of bits of ice in the mouth. The point is made that iced drinks are more refreshing under such conditions than the same liquids without the addition of ice. Externally it is helpful in the treatment of heat stroke, convulsions, and delirium, some headaches, and meningitis. In the *British Medical Journal* of April 15, 1899, Prof. Lindsay reported the recovery of a case of probable tubercular meningitis mainly through the continuous application of cold to the head. Cold applications to the head have been suggested in cerebral hemorrhage, but Bartholow considers that they might be harmful if the "face is pale, the surface cool, and the circulation depressed." Robb has found that ice applications to the face in smallpox give greater relief than any

other application. Ice applied along the whole length of the spine is also found to be of service in cerebro-spinal meningitis. In inflammation of joints and bursæ the icebag finds its most frequent field of usefulness. General ice pack to the trunk, or trunk and limbs, is stated to be of the utmost value in hyperpyrexia occurring during typhoid, acute rheumatism, scarlatina, and other febrile conditions, and Fielden considers that even if pneumonia occurs as a complication, the icepack is not contra-indicated. Rectal temperature should be watched under such conditions, and when it falls to 100° the pack must be removed. If it is continued too long collapse is liable to occur.

THE APPLICATION OF ICE IN LOBAR PNEUMONIA

P. A. Aurness, *Jour. A. M. A.* June 3, 1905

The author has used this treatment in pneumonia for several years with gratifying success. He applies it as follows:

As soon as a diagnosis is made, the patient is given a full warm bath for cleansing purposes, put to bed and given a laxative dose of calomel and soda. The chest area of the lung tissue involved is carefully outlined, and one or more, as required, specially constructed icebags are moderately but evenly filled with crushed ice and applied accurately over the parts inflamed. Each bag is wrapped in a thin layer of gauze and is furnished with a drainage pipe, the lower end of which empties into a basin below the bed. The main and important feature is this draining off the water as fast as it is formed, thereby establishing a constant and uniform ice application and utilizing the remarkable heat-absorbing quality of melting ice. Examinations are made each morning and evening, and the ice applications adapted to the changing areas of involved lung. There is danger, he claims, to the vitality of the parts, and the ice applications are kept up as long as the disease appears to be progressing and no threatening signs of collapse appear. In the latter event, ice applications are promptly removed, and stimulation is at once resorted to.

The internal treatment throughout the disease, aside from stimulants, includes free use of some mild alkaline mineral water, and five to fifteen-drop doses of creosote carbonate every four hours. The bowels are regulated by saline laxatives and enemas, the diet is guided by the digestive capacity, and free ventilation of the sick room is secured.

It is claimed that this treatment lowers the pulse while regulating and strengthening the heart, relieves respiratory difficulty and chest pains, and shortens the duration of the disease in the majority of cases. If begun within the first 12 hours the disease may sometimes be aborted.

HOT WATER IRRIGATION TREATMENT FOR THE RADICAL CURE OF HYDROCELE

Frederic Griffith, *American Journal of Dermatology,* June, 1905

Griffith considers that the irrigation treatment produces most gratifying curative results and eliminates the elements of danger to the patient, which accompany cutting operations and injections. His method of diagnosis is to press a metal cylinder, two inches in diameter and about 9 inches long, against the scrotum with a candle or simple sunlight upon the opposite side of the scrotum; the contents of the cyst look translucent if the case is hydrocele, unless the fluid contents are blood-stained.

The instrument recommended by Griffith for injecting hot water consists of two cannulas (Fig. 1) fitted upon a single trocar, an eye being added to the

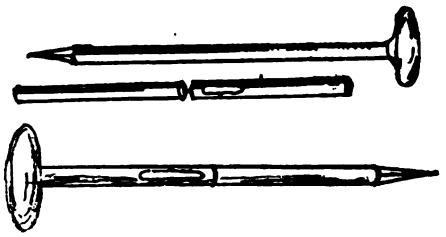

FIG. i.

upper cannula for the securing of prompter drainage of the sac. The side selected for puncture is cocainized by 4 per cent. cocaine hydrochlorate solution and the trocar inserted as for ordinary puncture. When the trocar has entered the cavity, a site free from vein markings is selected on the opposite side of the sac and the end of the trocar carried through it until it emerges from the skin (Fig. 2.) Before withdrawing

FIG. ii.

the trocar, the upper cannula is connected with the tube (fitted with a pinch-cock) of a two-quart fountain syringe suspended three or four feet above the patient's pelvis, and filled with water as hot as can be borne (120° to 160° F.). The two cannulas now being in position (Fig. 3), the one above attached to the hot water reservoir, the one below free, the trocar is withdrawn and after the hydrocele fluid has stopped gushing release the pinch-cock.

Thoroughly flush the sac under some pressure to dilate and to present the surfaces of all folds of the tunic to the action of the hot water. Withdrawing the cannulas and sealing the puncture sites with cotton wisps and collodion, followed by the application of gauze or a snug suspensory or T-bandage completes

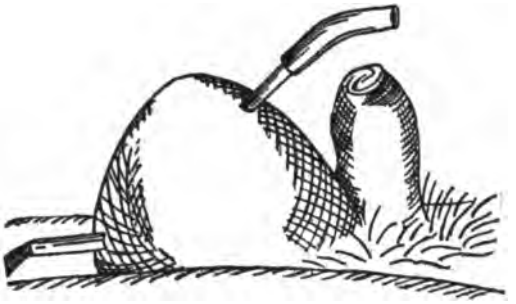

FIG. iii.

the treatment. The patient may resume his daily occupation without hindrance, for the only reaction is slight swelling and tenderness which pass away during the course of a week.

It is rarely necessary to excise redundant scrotum, as the natural tonicity of the parts will assert itself after a few weeks and "take up the slack."

WHAT IS DYSPEPSIA?

F. B. Turck, *Jour. A. M. A.*, June 10, 1905

Dyspepsia is considered to be one cause of national decay, hence its importance, not only to the individual, but to the state. The author describes the mechanism of digestion and shows how it depends on proper fulfillment of the functions of gastric secretion and motility, and how these depend on the general integrity of the splanchnic circulation which itself may be deranged by disorders of the gastro-intestinal tract, thus producing the vicious circle seen with many intestinal and gastric lesions. This connection of the circulation is very important in the treatment. If any one of the tripod — motility, secretion, and circulation — is disturbed, dyspepsia is the result.

The quantity and quality of the food, the times of eating, etc., are specially important in this connection, and in the treatment must be first considered. When dietetic measures fail, however, either on account of infection of the stomach from pyorrhea or nasopharyngeal catarrh, for example, other measures must be resorted to. The stomach may also be overloaded, and its muscles lose their power, with consequent stagnation and fermentation, and the various cardiac and other general symptoms of the condition. Here lavage may be directly remedial in removing the load and in stimulating the gastric peristalsis. When the mucosa is colonized with germs, however, simple lavage or even gastric douching may not suffice to remove them.

He advises the use of a double stomach tube for lavage or douching, the inlet tube with fine perforations, and the outlet with larger ones, thus projecting jets with considerable force against the gastric walls and allowing a free outflow through the larger tube. When this is insufficient to detach the colonies of germs from the mucosa his gyromele comes into useful application. Sometimes the introduction of hot and cold water successively proves most efficient through the mechanical and thermal stimulation produced. In cases of extreme gastric atony and dilatation, he uses the gastric bag dilator with air inflation, the repeated use of which will stir up the stomach and restore its motor function. In most cases the simple inflation of the stomach with air, medicated or not, is sufficient. Turck does not consider the use of electricity as of proved value in these cases, and he has not much faith in drugs excepting for the relief of symptoms, as in the use of alkalies for hyperacidity, etc. Antiseptics are apparently efficacious, but he considers them generally unnecessary.

DIETOTHERAPY

FOOD FOR THE HEALTHY ADULT

M. J. Wilson, *The Canada Lancet,* June, 1905

There is no food or combination of foods which one can say is the best for the healthy adult. What is proper for one man will often not agree with his neighbor.

Each race and nationality has its own special dietary. The Esquimo, the Nubian Arab, the Pampas Indians, the Fuijians, and the inhabitants of northern Norway live almost exclusively on animal food. The people of southern Spain and India are vegetarians. The Chinese and Japanese live largely on rice, but also eat eggs, fish, fruit, and vegetables.

The Esquimo obtains proteids and hydrocarbons or fats, as well as salts, from fish and animals. The vegetarian finds proteids in the various legumens, fat in olives, and salts and acids in fruits.

In the temperate zones a mixed diet is the rule. The laborer, especially if out of doors, usually eats more than the man of sedentary life. But, irrespective of occupation, individuals differ greatly in the amount of food consumed.

When three meals a day are taken, and lunches in addition, the digestive organs do not get sufficient rest. If only one meal is taken, there is danger of over-distention of the stomach. There is a growing impression that most people eat more food, and especially more meat than is necessary. Over-feeding, under-

feeding and injudicious feeding must all be avoided.

Nature provides wonderfully for the maintenance of mankind. In the Arctics, where hydrocarbons are required to keep up the body heat, the food supply is fats and proteids. In the tropics, where heat-producing foods are not required, and where meats keep badly, there are in abundance acid fruits, and vegetables, with legumens to take the place of meats.

Various articles of food contain varying proportions of the different proximate principles. Potato, considered a starchy food, contains also nitrogenous matter and fat. Rice contains more nitrogenous matter, wheat considerably more (12.42 per cent.), and beans, peas, and lentils from 22 to 24 per cent., with a small proportion of fats. Thus even the vegetarians get considerable proteid and fat. Vegetable proteids and fats are mixed with indigestible cellulose, and consequently are more difficult of digestion than animal foods. The animal has assimilated the proteids and fats from the vegetable kingdom, and presents them in a form ready for easy assimilation. In the vegetable diet, the indigestible cellulose gives bulk to the intestinal contents, and stimulates peristalsis. The vegetable eater also has a large amount of water in his food. This increases the bulk of fæces, and with the gases, formed by the fermentative processes incident to this kind of diet, keeps the bowels more active than they would be with the more digestible and less bulky animal foods.

Whatever form of diet is adopted, one must avoid eating more than the system requires, and whatever is eaten should be prepared in the best manner possible.

Every young woman should be taught to cook, not rich pastry, but plain meat and vegetables, with simple digestible deserts.

If cooking were put on a scientific basis, and a mixed diet of meat, bread, rice, vegetables, and cereals served, so as to produce a relish, the individual appetite could be depended upon in health, for the proportions of the various foods taken. These would vary from day to day, but the individual wants would be supplied in a satisfactory manner. The "new foods" and "pure foods" are often convenient as a change, but have neither the food value, nor digestibility, indicated in their advertisements. In this, as in prepared foods for infants, it is better that one should know how to prepare all the necessary foods at home.

THE DIETETIC TREATMENT OF DYSPEPSIA

Robert Hutchinson, *The Practitioner*, May, 1905

The term dyspepsia is used to cover all cases in which pain or discomfort is experienced during digestion. These may be divided into two groups:

1. Those in which there is some organic lesion of the stomach, such as ulceration, malignant disease, catarrh, or dilatation.

2. Purely "functional" cases, which have a nervous basis, and in which the secretion or the motility of the stomach is disordered.

Dietetic treatment is of greater service in the organic than in the functional cases. The latter are often little, if at all, influenced by the most elaborate schemes of diet.

The chief function of the stomach is a mechanical one — it has to reduce the food to a state of solution, and then pass it on to the duodenum. When there is any difficulty in digestion the meals should be small in bulk, and their component parts of such a nature as to be most easily dissolved and passed on. The large bulk of the coarser vegetables, and their richness in insoluble cellulose make them harmful to most dyspeptics. The great amount of dense connective

tissue in the tougher meats renders them difficult of disintegration. Foods richly impregnated with fat which encloses the other constituents, and prevents the ready access of gastric juice are difficult of solution in the stomach. Such articles as cheese and new bread, which can be swallowed in lumps, are potent causes of indigestion.

The term "digestible" is practically synonymous with "easily dissolved." On this plan food may be divided into four groups:

1. Beef-tea, lightly-cooked or raw eggs, milk, biscuits.
2. Sweetbread, boiled fowl, or pigeon.
3. Scraped underdone beefsteak, potato purée, stale bread.
4. Roast chicken or veal, cold roast beef (underdone), white fish, macaroni, rice, chopped spinach.

The secretion of gastric juice is influenced only a little by the mechanical stimulation of the food, but depends in part on the chemical constituents of the meal, and in part on the so-called "psychical" factor, which is associated with smell and taste of the food. Therefore it is important that the food should be well cooked, served in an appetizing manner, and eaten in agreeable surroundings.

One must not be so strict in dieting a dyspeptic patient that his general nutrition suffers. If the diet must be seriously reduced, the patient should remain in bed.

Gastric ulcer. The dietetic indications are (1) to avoid mechanical irritation, (2) to neutralize the usually excessive acidity of the gastric juice, and (3) to tax the motor power of the organ as little as possible. Milk meets these indications better than any other food, and is the best food in these cases. If there has been recent hematemesis it may be necessary to stop all food by the mouth, and administer nourishment by the rectum exclusively, but it is doubtful if the enemata really contribute in any serious degree to the patient's nutrition. Milk should be given every two hours, and other foods added very gradually.

Dilatation of the stomach. The indications for dietetic treatment are (1) to avoid overburdening the stomach with any large mass of food, (2) to avoid fermentable substances, which produce gases and increase the distention of the organ, (3) to facilitate the passage of the food into the intestine, because the stomach absorbs but little, and when it is dilated absorption is probably arrested altogether. The meals should be small, dry, and composed mainly of animal constituents. If there is actual obstruction at the pylorus, the stomach should be cleansed by thorough lavage, and the diet should consist of milk, peptonized if necessary, administered in small and frequent feeds. If the supply of fluid to the tissues becomes deficient, it may be supplemented by the injection into the rectum of a pint of normal saline solution night and morning.

Acute gastritis. The great indication is to give the inflamed organ rest. All food should be withheld while vomiting continues. Thirst may be relieved by sips of hot water, or sucking small pieces of ice. Great depression may be combated by champagne in small amounts.

Chronic gastritis. The chief indication is to avoid foods which may irritate the mucous membrane of the stomach, mechanically or chemically, and excite a secretion of mucus. Among these are the stones and skins of fruit, whole wheat bread or oatmeal, tough meats, mustards, spices, pepper, and other condiments, alcohol, especially in its more concentrated forms, sugar, especially cane sugar, and fatty substances, especially when cooked. Butter and bacon fat can usually be eaten in moderation. The food should be finely divided, eaten slowly, and but little should be consumed at a time.

Functional dyspepsias may be divided into three chief groups: 1. Cases of ex-

cessive secretion of acid or of gastric juice. 2. Asthenic cases in which the secretion of acid or of gastric juice is diminished with or without impairment of motility. 3. Cases characterized chiefly by flatulency.

"Acid dyspepsia" or *hyperchlorhydria* may be treated by giving farinaceous food, because it is believed to excite the least secretion of acid in the stomach. But probably the best results will generally be obtained by giving a diet composed mainly of animal constituents, which are rich in proteid, because this takes up and fixes the hydrochloric acid. There is no better animal food for the purpose than milk, but meat may also be taken freely. Chemical excitants should be avoided, also sugar and other sweet things, as well as sour things. Fats seem to have a restraining influence on gastric secretion, and may be taken, especially in the form of butter and bacon.

Atonic forms of dyspepsia, on the other hand, demand excitants of gastric secretion, such as soups, meat extracts, salts, and other condiments. Foods which make great demands on the solvent power of the gastric juice, such as meats, should be restricted. The meals should be small, and all bulky articles should be avoided. It is in these cases that alcohol is sometimes useful, by acting as an excitant of secretion, and as a stimulant to the movements of the stomach wall.

Dyspepsia with flatulency can be greatly benefited by an appropriate diet. Fermentable articles should be forbidden, especially green vegetables, the pulses, and sweets. Rusks or crisp toast should be substituted for bread, and potatoes should be eaten very sparingly. The meals should be dry. Tea should be avoided, and hot water should be drunk between meals.

MECHANOTHERAPY

TECHNIQUE OF MECHANICAL MASSAGE IN THE TREATMENT OF THE THROAT, NOSE, AND EAR

M. R. Brown, *Illinois Medical Journal,* June, 1905

The author says it is universally conceded that, by increasing the circulation through the lymph and blood vessels, massage relieves acute inflammation, and when the inflammation has come to a standstill, or become chronic, by the same means it rouses the dormant capillaries, furthers absorption, and stimulates the vaso-motor nerves.

It is essential that the instrument employed in mechanical massage be suited, by virtue of the character of its vibrations, to the parts to be massaged, and that the form of vibration employed be adapted to the relief of the pathological changes to be overcome, just as it is essential to manual massage, for the masseur to understand when to employ effleurage or other of the various movements necessary for the success of his art.

To reach the pharynx the vibratode is placed below the angle of the jaw, and in front of the sterno-cleido-mastoid muscle and pressed inward and backward. The patient should be carefully watched during the first few treatments, as evidence of approaching syncope has been noticed several times while vibrating over the region of the vagus nerve.

The larynx is treated by gently grasping the thyroid cartilage on the outside

between the forefinger and thumb, which are vibrated by the vibratode held firmly, somewhat like a penholder well up in the crotch, between the forefinger and thumb. In vibrassage of the nose, the soft rubber cup vibratode is passed downward over that organ, and on the neighboring sides of the face and above on the forehead. In ear vibrassage the soft rubber cup is passed downward in front of the ear, then behind the ear and over the mastoid and over the space between the mastoid and the angle of the lower jaw, after which it is placed directly over the ear so as to cover the external auditory meatus. In these positions it vibrates the more superficial parts of the ear; in order to reach the deeper portions of the ear and the eustachian tube the vibratode must be taken between the forefinger and thumb as has been described, and the tip of the forefinger, which now becomes the vibratode, should be put in the orifice of the external auditory canal.

If improvement does not follow within three or four weeks it is not considered advisable to prolong treatment.

The indications for the use of massage in diseases of the throat, nose, and ear are the same as for other parts of the body; namely, for the relief of neuralgia, rheumatism, paralysis, enlarged glands which accompany or follow some forms of tonsillitis, and (owing to its well known antiphlogistic value and the rapidity with which it removes exudations) acute and chronic non-suppurative inflammatory affections.

In dry rhinitis it will increase the moisture in the nose and it will relieve the intense pain we occasionally encounter over the bridge of the nose, extending up and over the forehead in certain intra-nasal inflammatory disorders. It is indicated in acute pharyngitis, non-suppurative, and non-membranous, in its many forms, such as is manifested by inflammation of the deeper tissue and of the mucous membranes covering the various anatomical regions in question.

In the treatment of chronic ear conditions, as to breaking up adhesions of the membrana tympani and rigidity of the ossicles, vibrassage compares favorably with pneumomassage, which has for some time occupied a foremost position for this purpose in the minds of many otologists and which in Brown's opinion has been much over-rated. With pneumomassage one can impart to the membrana tympani a to-and-fro motion which will break up adhesions, but its injudicious use is apt to create too much relaxation. Its effect on the rigid ossicles is not so satisfactory as we are sometimes led to expect, nor can we with it massage the middle ear, which is so essential for the ultimate success of treatment, as can be done with the vibrators; therefore its value as a therapeutic agent is but limited.

NEURASTHENIA CURED BY EXERCISE AND FORCED FEEDING; REPORT OF TWO CASES

E. L. Hunt, *Jour. A. M. A.*, June 3, 1905

The first case was that of a man aged 45, who had been ill six months and whose disease had taken on a violent form accompanied by delusions, and it was necessary to have him watched by two attendants constantly. When he came under Dr. Hunt's observation "he presented the general appearance of one suffering from an acute mental disorder of considerable violence. He paced the room, rarely if ever sitting down. His hands were constantly employed. The eyes were wild and restless." The treatment instituted was as follows:

"The day began at seven, when the patient was given a cold plunge, followed by a glass of milk. An hour later he was given a substantial breakfast, consisting of cereal, meat, eggs, and milk, of all of which the patient was encour-

aged to eat heartily. Immediately after this the nurse took him out for a long, brisk walk, of about five miles. The route lay through the resident district toward the suburbs. At 11.30 he returned for a glass of milk with an egg; the next hour was given up to a complete rest and relaxation. At 12.30 the nurse tried to interest him in reading or cards, and promptly at 1 a hearty dinner was served. An hour was spent at the table, as there was soup, a roast, several vegetables, dessert, and sometimes more. Neither tea nor coffee was served, only milk and water.

"At 2 P. M., the patient started out to spend two and a half hours away from home, exercising. If the weather was mild, he and the nurse played golf, tennis, or croquet; if stormy, they bowled or played ping pong. Billiards and pool were suggested, but owing to the difficulty of getting a suitable place, were abandoned. Sometimes they walked. At 5, another glass of milk with an egg were taken. Then the physician called and the patient reported his condition, relating in his own language and in his own way the events of the preceding 24 hours. For the next half hour he rested. Promptly at 6, nurse and patient spent twenty minutes in hard indoor exercise, such as punching the bag or playing at handball. A cold shower bath followed, and at 7 came a substantial supper with meat and eggs.

"The evenings were devoted to games and conversation. At 10, indian clubs and dumb-bells were brought out, and at half-past ten the patient had a glass of milk and retired."

When the treatment was begun the patient was so restless that small doses of bromide were administered every three or four hours, and a tonic consisting of iron and strychnia was given after meals. Before meals one of the glycero-phosphates was given in hot water. By the end of the week there was a manifest improvement, at the end of the second, the restlessness had diminished, and during the third the patient began to read papers and sleep for two or three hours at night. After six weeks he was so well that he attended a ball game and a matinée, and at the end of three months he began to go about alone, expressed a desire to see his friends, and attended church. His improvement continued until in seven months after inauguration of the treatment he was discharged well and resumed his business.

The second case was that of a woman aged 55, unmarried. She was greatly depressed mentally, very weak, her weight had dropped to 97 pounds, and the pulse was rapid; it was necessary to employ two nurses in caring for her. Sanitaria treatment had been tried without avail. The line of treatment employed with this case was as follows:

"I saw her first in midwinter, and after in vain trying sedatives, companionship, etc., I resolved to put her on the food and exercise cure. Two strong-minded nurses were provided, and she began with three slight meals, and three glasses of milk daily. The first day she walked only two blocks. Each day the distance was doubled, and when she had walked a mile, the next day she was made to walk two. The feeding was as rapidly increased, so that she took three large meals, a light luncheon, quart of milk, and three raw eggs daily. She began to gain weight very rapidly, to become quieter and to sleep. The exercise was then increased, until at its maximum she walked five miles daily. The feeding was almost beyond comprehension, as she took two quarts of milk daily, six raw eggs, and three big meals. She gained twenty pounds and gradually began to take an interest in her surroundings. Her entire time was now spent in eating, walking, and resting. Each demanded the other. A cycle had been established, she continued to improve, and by summer was able to go away with only one attendant. The forced feeding

was diminished, but the exercise was increased."

Nine months after she came under Dr. Hunt's care she had completely recovered, and constitutes a most gratifying illustration of the value of forced feeding and exercise in the treatment of this most harassing of diseases.

PSYCHOTHERAPY

NOTES ON THE PRIMITIVE BLACK

Dr. Galliere, *Archiv. de Psychologie*, February and March, 1905

We are coming to find in the psychology of the savage mind a field of considerable richness. Phenomena of a simple type, almost archetypal and germinal, present that end of genetic series which is usually obscured to our eyes.

Kraepelin has remarked upon the abnormalities of the Javanese in a recent book; Wundt in his Volkerpsychologie, has made a notable contribution, but the anthropologist has naturally been the heaviest writer in this field. It is a field, however, in which the psychologist should do more and in a very fragmentary bit Dr. Galliere presents some interesting notes.

In particular the sensory field of the savage is described as being very wide, both in his reaction to color, discrimination of distance, form, localization, etc. Memory is remarked as being excellent, attention acute, while the higher centers of affectibility, association of ideas, etc., although simple are organized to the point of fitness for their environment.

As a study of the ancestor of our American colored man, it is a brief and interesting study.

SUGGESTION

F. J. Runyon, *Jour. A. M. A.*, May 6, 1905

Physicians should cultivate a proper mental attitude toward the power of suggestion, which, as Runyon says, "runs like a thread through every method of treatment, wise or otherwise." He also notes the dangers of self-deception in medicine and of drawing deductions from imperfect data or without due power of discrimination. While suggestion is often a power for good in the hands of the physician, it is one that may be abused and result in great and lasting harm. It is the main instrument of the pretenders; he reviews some of the noted instances of their exploitation of human credulity. The point emphasized by him is that the true practice of medicine is the intelligent application of common sense principles and forces.

BOOK REVIEWS

ROENTGENOLOGISCHES HILFSBUCH. Eine Sammlung von Aufsätzen über die Grundlagen und die wichtigsten Hilfsmethoden des Roentgenverfahrens. Mit einem Anhang über Radioaktivität. Mit 33 Abbildungen. Gesammelte Aufsätze von Ingenieur Friedrich Dessauer. Band I. Wurzburg. A. Stuber's Verlag (C. Kabitzsch), 1905. Preis brosch. Mk. 3. 50., gebd. Mk. 4. 20.

As the title indicates, this book is a collection of essays upon the fundamental principles, and the most important aids in their application in X-ray work. The author discusses scientifically the difficult problems that confront the advanced student in X-ray work. Examples of these problems are the source of the primary and secondary rays, and the methods of excluding the secondary rays, the selection and handling of the X-ray tube, the diaphragm technique and its combination with orthodiagraphy, the best sources of electricity, the proper spark length of a coil, etc. There is also a discussion of radioactive matter. As a whole it deserves a place in the library of the radiologist.

SYSTEM OF PHYSIOLOGIC THERAPEUTICS. By Cohen. Vol. IX; Hydrotherapy, Thermotherapy, Phototherapy, Mineral Waters, Baths. Winternitz, Kisch. P. Blakiston's Son & Co., Philadelphia.

This number, the ninth in the series, is no less complete as a volume than is the system as an entirety. Beginning with a consideration of the physiologic basis of the treatment to be detailed, the technique follows. This is given with a conciseness and profuseness of excellent illustrations which accomplishes the object with a minimum effort to the reader who is not, as frequently in books of this class, burdened with a mass of superfluous detail. Following this and under the heading of special hydrotherapy is considered the application of treatment to various disorders which the author believes amenable to hydrotherapy. In so far as is reasonable prognoses are given and the immediate results of treatment are carefully considered. Phototherapy is equally well presented. Thermotherapy as a subject receives the same attention, but the consideration of superheated air (hot air pack) is meager. This is the only topic in the work to which this criticism may be applied.

The subject of mineral waters and baths would be difficult to improve upon. From a reference standpoint alone it would be extremely valuable. Nearly every known water and spring is mentioned and an analysis given of most. Beginning with a discussion of the various classifications in vogue it closes with the indicated treatment of the various conditions from which help may be expected by the use of mineral waters or baths.

There has been added an appendix. Considered as a whole it is an extremely valuable reference book.

KONSTRUKTION UND HANDHABUNG ELEKTROMEDIZINISCHER APPARATE. By von Johannes Zacharias und Mathias Musch, Ingenieure. VII, 292S, mit 209Abb. Verlag von Johann Ambrosius Barth in Leipzig. Preis elegant broschiert M. 8, —, gebunden M. 9. —

This work seems to fill a long-felt want. It is valuable both to the manufacturer of medical electrical appara-

tus and to the physician who intends to use electrical apparatus either as a remedial or diagnostic measure. The book is comprehensive and includes a complete description of the apparatus and technique used in the production of electricity. Under this heading we find valuable instruction as to the care and handling of storage batteries, which is of great practical importance to physicians. This chapter is followed by a description of the various forms of electric lights, electric motors, switches, meters, rheostats, and electric heating apparatus.

All are well illustrated.

The apparatus used for diagnostic purposes are taken up in detail. This includes the Roentgen rays, various forms of interrupters, etc., and a special chapter upon electro-endoscopy, and diaphanoscopy.

Following this the authors describe the apparatus and technique used for therapeutic purposes, including the Roentgen rays, galvanization, cataphoresis, Franklinization, faradization, and magnetic apparatus.

Each chapter is followed by the references to the literature bearing upon the subject. This will be of especial interest to American workers, because it is apparently a complete record of foreign literature, though very little of the American literature is included.

Sufficient detail has been given in describing the principles upon which the apparatus is constructed to make the book of value to the beginner, while the most modern apparatus and technique are fully described, thus making it of value to the expert engineer and electrotherapeutist. The work is well illustrated, and the illustrations are well chosen and quite clear.

Second Special Number

In honor of the Annual Conventions of The American Electro-Therapeutic Association and The American Roentgen Ray Society

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Figure 1

Dr. Anders' case. Shows the earliest possible lesions, in the stage of congestion, as proven by autopsy.

Figure 2

Dr. Hollopeter's case. Shows general infiltration of both lungs with no large areas of consolidation or cavities.

Illustrating the X-Ray in the Diagnosis of Pulmonary Tuberculosis — *Pfahler*

Figure 3

Dr. Anders' case. Shows general, small, and probably early infiltrations, with thickened pluera, and a calcified tubercle near the angle of the right scapula.

Figure 4

Shows infiltration of both apices with scattered deposits lower down, and dense shadows probably indicating calcified tubercles: also a uniform shadow at the angle of the right scapula which probably indicates a thickened pleura.

Figure 5

Dr. Daland's case. Shows general infiltration of both lungs, with at least two cavities in the right lung and one in the left.

Figure 6

Shows general infiltration, with a large area of consolidation to the left of the apex of the heart.

Figure 7

Dr. Hollopeter's patient. Shows consolidation with abscess formation at the lower portion of the right lung "A," and tubercular infiltration of the left lung.

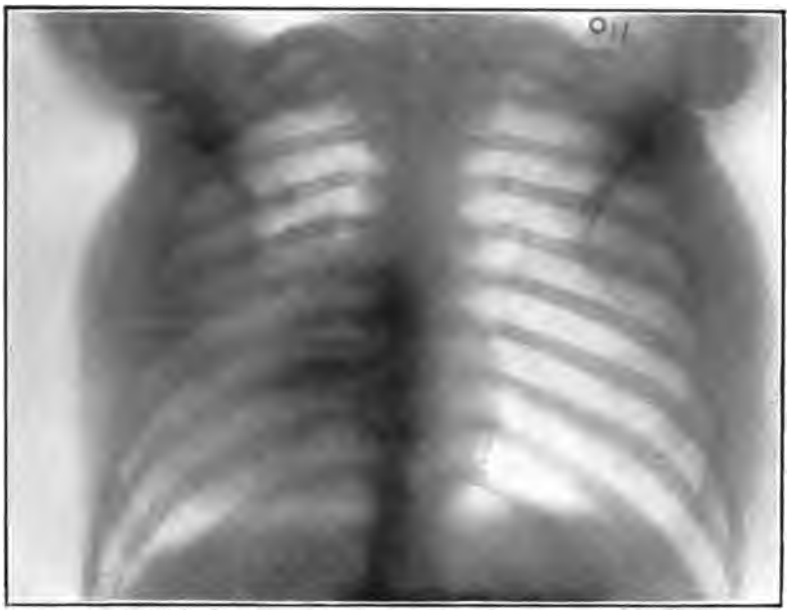

Figure 8

Dr. Anders' patient. Shows large single area of complete consolidation lying to the left of the heart, with small infiltrations projecting toward the apex. This followed an abortion and was at first thought to be an infarct.

Figure 9

Dr. Anders' case. Shows an old process at both apices, with calcified tubercles in the left lung.

Figure 10

Shows small rather dense fibrous bands at the apices of both lungs, which probably indicate old fibrous or healed lesions. " D " indicates a larger deposit at the left apex. The ninth rib shows a probable old fracture.

Figure 11

Dr. Daland's patient. Shows a large cavity at the left apex marked " C," which is surrounded by a dense wall and is subdivided by remaining bands of diseased lung. Below this cavity may be seen tubercular deposits infiltrating the lung. There is some deposit at the right apex. The 9th and 10th ribs, two inches from their articulation with the vertebra, have the appearance of old fractures, and beneath the pleura appears to be thickened. The aorta is dilated and probably tortuous.

Figure 12

F. W., skiagraphed in the Philadelphia Hospital, January 29, 1901. Points of interest are as follows:

First, complete consolidation of the right lung, with five cavities at the apex (C, C, C, C, C,).

Second, complete displacement of the heart to the right, probably in part due to compensatory emphysema and in part to adhesions.

Third, beginning tubercular involvement of the left apex.

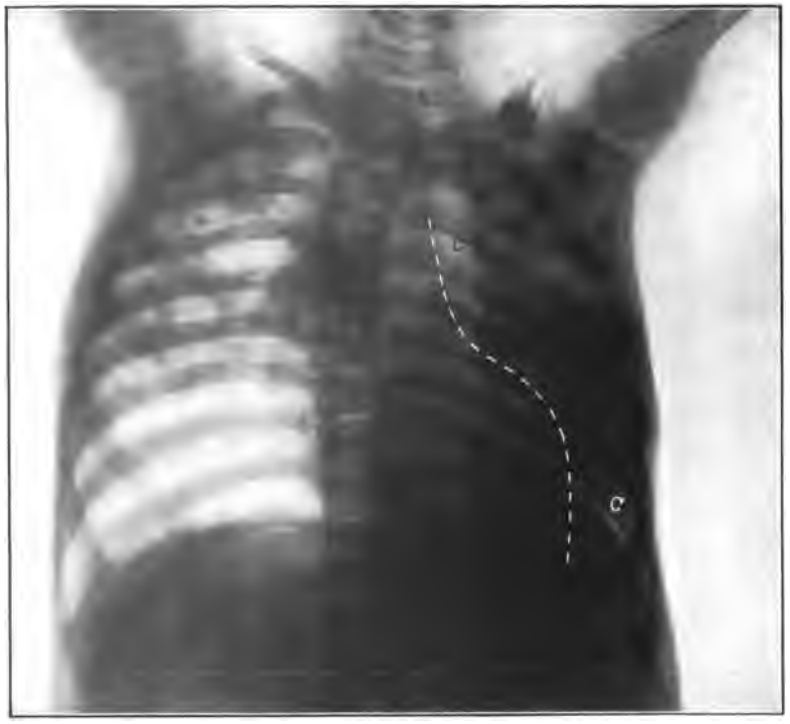

Figure 13

Dr. Lowenberg's case. Shows complete dextrocardia, the outline of the heart being indicated by the dotted line; complete consolidation of the right lung, with three distinct cavities; infiltration of the upper portion of the left lung; curvature of the spine.

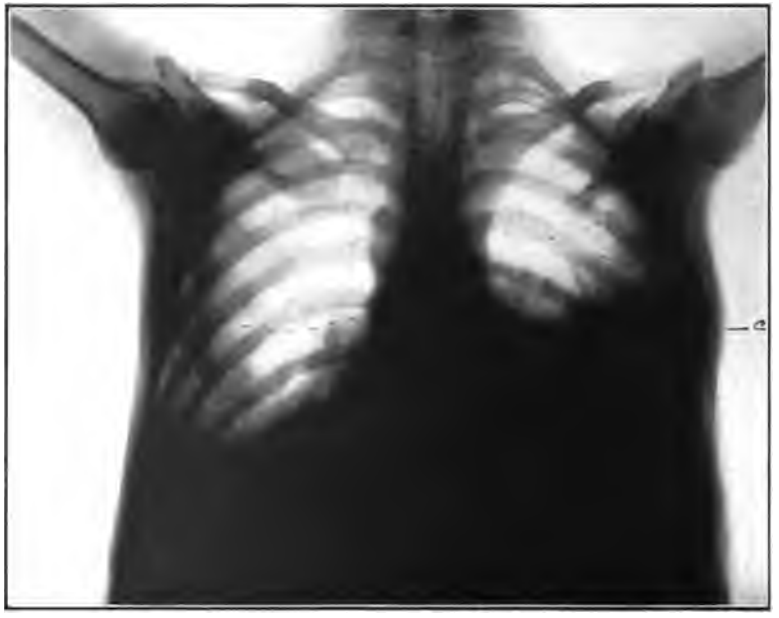

Figure 14

Dr. Anders' patient. Shows pleural effusion extending to the 5th rib posteriorly on the right side and to the 7th rib on the left side; also a consolidation of the right side in the region of the right middle lobe, " C."

Illustrating the X-Ray in the Diagnosis of Pulmonary Tuberculosis — *Pfahler*

The Archives of Physiological Therapy — September, 1905

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THE X-RAY IN THE DIAGNOSIS OF PULMONARY TUBERCULOSIS.*

BY G. E. PFAHLER, M.D., OF PHILADELPHIA, PENNSYLVANIA.

Formerly Assistant Chief Resident Physician in the Philadelphia Hospital; Director of the X-ray Laboratory, and Assistant Physician to the Medico-Chirurgical Hospital, Lecturer upon Symptomatology and Demonstrator of Physical Diagnosis in the Medico-Chirurgical College.

IT is generally conceded that if pulmonary tuberculosis can be diagnosed early it can be cured, and the earlier it is diagnosed the more readily is it cured. It is desirable that the diagnosis should be made before bacilli can be detected in the sputum, and at times it should be made before a cough manifests itself. I believe that this can be done more accurately with the X-ray than by any other means at our command. The information obtained through the X-ray should not be used as the only evidence, but as additional, or confirmatory evidence.

The X-ray has been used for a number of years in the study of tuberculosis of the lungs. One of the early workers in this field was Williams of Boston. He as well as the rest of us, however, depended upon the fluoroscope, because the moving shadows could not be well recorded upon the plate. Kassabian tried to overcome the effect of movement by making the exposures upon the installment plan, and presented in 1902 a skiagraph made by this method in 30 seconds. Hulst the same year showed skiagraphs of the chest made in one and one-half seconds.

Negatives made on the installment plan are unsatisfactory because it is almost impossible to get a patient to stop breathing with the lungs and diaphragm in the same position twice. On the other hand, when the exposures are reduced to a second, the plate is much under-exposed and requires very strong developer which gives a hard negative with much of the soft detail lost.

Even a second is too long an expos-

* *Read before the Philadelphia County Medical Society, April 26, 1905.*

ure to study the movements of the heart. For all practical purposes, an exposure made during the time in which the patient holds his breath is instantaneous—that is, the parts are quiet and can be photographed in position. This will require that the exposure be made in from 5 to 20 seconds. There are few patients requiring an X-ray examination who cannot hold their breath 5 seconds and few who can hold it more than 20 seconds.

In order to accomplish good results in this short time, the tube must be in condition to receive a maximum amount of current at once. It is therefore well to test the tube always before the exposure is made. The patient must be under the operator's control, which is accomplished by having him hold his breath several times as a test. This will also give the operator a chance to estimate the time during which the exposure must be made.

The clearness of the shadows on the negative will be considerably influenced by the thickness of the chest wall. Fat and muscle cast a very decided but general shadow, and will obscure the lung shadows to a considerable extent.

As a rule I place the patient in the supine position, but when a pleural effusion is present or a pneumothorax is suspected, I place the patient in the sitting posture. The tube is placed at a distance of 18 to 20 inches from the plate, in the median line, on a level with the third interspace. If the condition of the pleura is to be studied anteriorly the patient must be placed in the supine position.

Under these conditions, deposits a quarter of an inch in diameter can be detected, and an experienced eye can separate the old fibrous tissue or scar, and calcareous deposits from the new lesions. Cavities, consolidations, abscesses, displacements of the heart or enlargement of the mediastinal glands can be detected.

In days gone by the fluoroscope seemed to offer distinct advantage over the photograph, but the plate is distinctly more sensitive than the fluoroscope and the eye, and since the lung can be photographed in the resting position, it has little use today. If we can see the actual shadows of each tubercular deposit, we do not need to guess about it by estimating the relative movement of the diaphragm on each side. Since we can obtain an accurate record of each deposit we do not have to estimate the comparative density of shadow on each side. Therefore since fluoroscopy adds nothing, but exposes the operator to a dangerous amount of rays, I have discontinued its use in the study of the lungs.

By the X-ray we not only recognize the active lesions, but the small calcified tubercles which must of necessity escape our ordinary methods of physical diagnosis.

The X-ray examination is also important as an accurate and permanent record of the case. By this means we can compare and estimate the progress in each particular lesion by comparison of the shadows.

Interpretation. Tubercular deposits cast definite shadows corresponding to their size, location, and consistency. Recent lesions of the same size are less dense than old lesions in which calcareous deposits, or cicatricial tissue has developed.

Cavities are indicated by a well-marked area of transparency surrounded by a more dense wall, which corresponds to the surrounding area of consolidation.

Pleural thickening is shown by a rather diffuse, uniform shadow which lacks the usual mottled appearance seen in infiltration of the lungs.

Pleural effusion is recognized by a general uniform shadow occupying the lower part of one or both sides of the chest and having a definite upper border.

Pneumothorax is recognized by a very large transparent area occupying one

side of the chest, extending in a vertical direction and usually having at its lower portion the shadow of fluid. If examined with the fluoroscope, the upper border of the fluid can be seen to move with each movement of the patient or diaphragm, and if the patient is shaken it can be seen to splash.

A consolidation can be seen through the fluid of pleural effusion. This is seen in one of the skiagraphs presented herewith. An interesting feature in this case was the presence of tubular breathing over the entire area of effusion. The presence of this consolidation could not be clearly demonstrated by physical examination. It is possible that this peculiar physical sign may be explained at times by the presence of a consolidation which transmits the vibrations of the voice and breath from the bronchi to the fluid and thence through the chest wall to the ear.

We must, of course, suspect tuberculosis before any X-ray examination will be undertaken. It should not be our aim to replace ordinary physical examination, but to add the results of the X-ray examination as so much additional evidence.

I believe, therefore, that the X-ray is of distinct value in making a diagnosis; that lesions can be detected more accurately than by any other method; and finally that it is the most accurate method of recording these lesions.

ON RADIUM PHOTOGRAPHS OF THE STOMACH

BY MAX EINHORN, M.D., OF NEW YORK CITY.

Professor of Medicine at the N. Y. Postgraduate Medical School.

IN a previous paper[1] I mentioned the fact that it is possible to transilluminate the human stomach with radium. The transillumination can be demonstrated with Kahlbaum's barium platino-cyanide screen or by means of a photographic plate. The latter method has the advantage that first no dark room is required and secondly the result obtained is visible to everybody and there is no room left for imagination or speculation.

It appeared to me worth the trouble to test this method of examination on a number of patients and to give a detailed report.

[1] *Max Einhorn: Observations on Radium. Medical Record, July* 30, 1904.

Method

In order to procure a radium photograph of the stomach proceed as follows: The patient should be in the fasting condition (empty stomach). The radio-diaphane containing 0.05 gm. (or more) of pure radium bromide is introduced into the stomach. Patient occupies a recumbent position and a photographic plate (Cramer's X-ray plate) enclosed in a dark envelope is put directly over the gastric area and left there for one or two hours according to the requirement of the case. The plate is then removed and the radio-diaphane withdrawn. The plate is then developed.

I have used this method of taking photographs through the stomach on a considerable number of patients. Contrary

to my expectations radium enclosed in a quartz flask failed utterly to transmit the photographic rays, while thin ordinary glass answered the purpose very well.

The shortest time for obtaining a photograph outline of the stomach is one hour; in less than an hour hardly anything is visible; one and a half to two hours bring out the outlines more distinctly. Insufflation of air into the stomach occasionally aids in obtaining a good picture.

A few of the better radium photographs in my possession are reproduced herewith, and show that transillumination of the stomach by means of radium is feasible. It is even possible to recognize an area of light which had to pass through the posterior wall of the stomach and the back of the thorax. One of my negatives shows a key which was hanging below the left scapula and was thus photographed by the transmitted light from the stomach.

Considerable tumors of the stomach or liver (left lobe) can, sometimes, be recognized on the picture by the diminished translucency. Thus far, however, I have not succeeded in obtaining definite outlines of the growth.

THE PENETRATING POWER OF THE STATIC CURRENT

BY ADOLPH DECKER, M.D., OF CHICAGO, ILLINOIS.

IN spite of many indisputable cures accomplished by its employment static electricity has not yet been accorded its merited universal recognition. We may divide its adversaries into two classes: those who do not care to apply electricity in any form, and those who draw the line on this particular modality.

The first class is hardly worthy of notice in this connection, as it consists of those physicians who do not know electricity and never took the trouble to get acquainted with it, so that they cannot be expected to have any idea of what a powerful remedy it is in the hands of the expert.

The second class, which is only prejudiced against electricity as furnished by the static machine, is composed of different elements. There are those who, from the history of frictional and static electricity in medicine (first praised as a panacea it was later relegated to oblivion), draw conclusions to justify their standpoint. Others are influenced by authorities who deny its value; for instance men like Duchenne de Boulogne, who said that "static electricity has no influence whatever on internal organs, cannot alter the pulse, the secretions, or the mental functions and, its therapeutic importance being equal to its physiological, has been rightfully abandoned." But the majority turn away from it because they believe that it flows on the surface, is only a superficial charge without any effect in the way of penetration. It does not go, they say, into the deeper tissues, resides only on the skin and is therefore without any therapeutical value.*

**It is chiefly European physicians who are not convinced that the static current is conveyed into the deeper tissues. Eulenberg (on general and local electrization, "Berliner Klinische Wochenschrift," 1887) says: "Could we assume that despite its apparently local and superficial effects the high tension electricity will collect in sufficient quantity and tension in the inside of the conductor, i. e., in this case, of the charged body,*

Figure 1

Mrs. Millie S. Radiumphotograph taken through the stomach with 0.05 g. pure radium bromide on March 26, 1905, exposure 1½ hours. Upper line of plate about 3 fingers above the margin of ribs. Ring lies somewhat to the right and about 1½ inches below the navel. The light zone represents the transilluminated area of the stomach. Some rays penetrate the adjacent viscera and, although not bright, appear somewhat grayish. In this area the ring lying a trifle below the stomach has been photographed.

Figure 2

Mrs. M. S. Radiumphotograph of stomach, taken on May 21, 1905, with 0.07 g. radium bromide and one hour exposure. The ring was placed on the navel: the upper part of the plate corresponded to the ensiform process. There is an area of light marking the gastric cavity, the stomach extending just to about the navel.

Illustrating On Radium Photographs of the Stomach — *Einhorn*

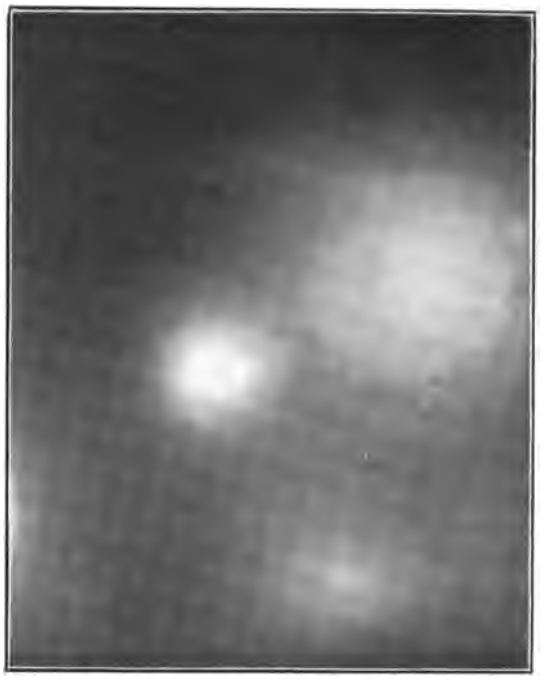

Figure 3

Radiumphotogram of H. S. taken May 10, 1905, with tumor of the liver overlapping the stomach. Radium bromide 0.07 g. 1½ hours exposure, lying. The upper part of the plate corresponded to the ensiform process, a ring was attached to the navel. The very bright circle probably corresponds to the radium capsule; part of the ring to the left is visible as a shadowy curve, while its right part was too near the radium and thus does not show. The stomach outlines appear quite distinctly on left side of the picture while to the right the tumor darkened the field. In the lower portion of the picture there is a lengthy, grayish area which may have been caused by an intestinal coil filled with gas and partly transilluminated.

Even if this should be true the numerous cures due to the use of static electricity could not be denied. We might ask logically, however, if it is or could be scientifically proven that static electricity does *not* penetrate below the outside integument of the body? Is static electricity, in its intrinsic nature, different from other electrical modalities? To be sure it is produced or generated in a different manner, but is it not electricity nevertheless, with all the qualities belonging to electricity?

1. Static electricity has electrolytic power; water, for instance, can be decomposed by the static machine just as well as by the voltaic battery. Ritter † in 1799 decomposed acidulated water by discharges of the friction machine. Wollaston showed a sediment of copper when he, by means of a wire, introduced the spark of a strong (friction) machine into a solution of sulphate of copper (1801). Faraday repeated this experiment by bringing a drop of a solution of sulphate of copper between the prime conductors.

2. This goes to show that there is a positive and a negative pole, an anode and a cathode, which differ in respects other than those involving higher and lower potential simply.

3. The static machine, as well as the Ruhmkorf coil, may be used for the illumination of Geissler tubes and the generation of X-rays; which also demonstrates a difference between the positive and negative poles.

4. The Tesla coil may equally well be connected to the static machine or to the induction coil.

5. The continuously-flowing electricity, the continuous current of the galvanic battery, produces no sensation (provided the amperage be not too high); a person, in the same way, taking hold of the two prime conductors of a static machine with his two hands has also no sensation. Lewandowski (On Franklinotherapie, *Allg. Wien. Med. Zeitung,* 1889) says: "If in a friction or influence machine, the prime conductors or discharging rods are metallically connected by a wire, then an electric current permanently circulates through this external circuit. I tried to convey this current to a human body on the insulating platform and became convinced of the presence of a 'continuous flowing' of electricity as long as one takes care that the electrodes are in perfect contact with the skin. . . . . I found that by means of a galvanometer it can be shown that a continuous electric current flows through the external circuit and that if there be no change in the speed at which the machine is run this current remains immutably continuous."

6. If the current of the static machine, a person closing the circuit by being placed between the two prime conductors, is interrupted, for instance, by approaching a grounded ball electrode to one pole, a contraction is produced similar to the contraction caused by a voltaic alternative.

7. Static electricity follows the better conductor.

Some experiments by E. Mach * are of interest in this connection and their forceful logic cannot be disputed.

"In Fig. 1 let A B C D be the vertical cross section of a wire basket. If the basket is placed on a piece of tinfoil (C D), and together with this on an

— in order to explain certain phenomena and especially the therapeutic effects, I believe I must, from lack of satisfactory criteria, leave this question undecided for the present, but I regard, both from theoretical and empirical reasons, an affirmative answer as highly improbable."

†*Vide Kurella Zeitschrift für Electrotherapie, Jan.,* 1903.

**E. Mach. Experiments and remarks on Herr Melsen's lightning arrester system. Litzungsber. der Kais. Akademie der Wissenschaften, Math. naturwissensch. Classe* 1883. *Vol.* 87, *page* 623.

insulating platform, an electroscope enclosed in it will not be affected when the basket is charged or discharged by a strong current. Also when the tinfoil

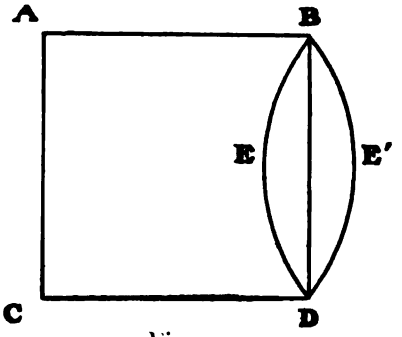

Figure 1

is connected to the outer layer of the jar and strong jar sparks are sent through the basket, the electroscope will remain quiet. The same experiments with the same results may be repeated by substituting for the wire basket a gold-paper basket (supplied, of course, with windows through which to watch the electroscope).

"Now we place in the basket a branch wire circuit consisting of a copper wire of 1 millimeter diameter, in which, at A, by means of two needles whose points are at a distance of about 1 mm. from each other, an air gap is formed which contains a pinch of fulminating silver. If the basket is traversed by a strong jar discharge, the fulminating silver will not be affected by it. The explosion will not occur either if we place the branch circuit, without any other change, outside the wire basket between the same points B and D, so that it goes to B E D. The explosion, however, will take place without fail as soon as the wire basket is replaced by the gold-paper basket, no matter whether the branch wire is situated inside or outside the basket.

"Thus the surface theory does not hold good in this case. The essential difference between the wire basket and the gold-paper basket is rather in the considerably greater resistance of the latter which makes a much higher potential necessary. In consequence thereof the electromotive force in the branch circuit becomes sufficiently great to force the electricity across the little spark gap."

To show that the same is true for man, in the domain of therapeutic franklinization, I submit the following experiments:

a. Fig. 2 shows an arrangement I frequently make use of in the treatment of patients. It is based on the same idea as Monell's potential alternation, but I prefer it because the patient cannot be frightened by unexpected sparks (through the soles of the shoes) and because a very wide range of dose regulation is possible, both by changing the distance of rod and patient, and by either grounding or not grounding the stand electrode. If a person uncon-

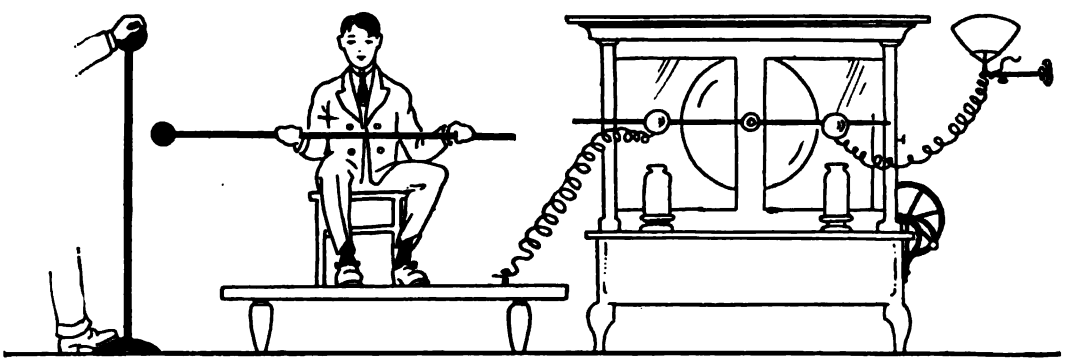

Figure 2

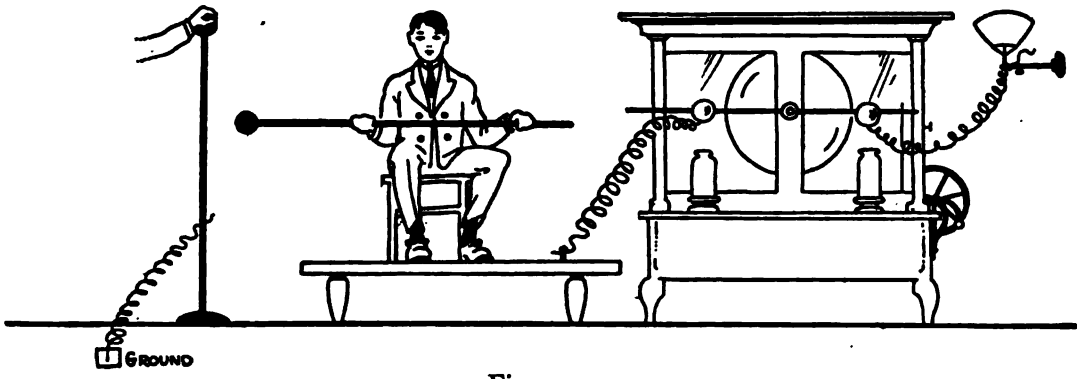

Figure 3

nected with the machine places both hands, one bare and one covered with a glove, or a bare hand and a shoe covered foot on the stand electrode he will feel the effect of the interrupted static current *only at the bare hand,* but at the glove covered hand or at the foot *only after he takes the bare hand away.*

b. Fig. 3. The same arrangement as in the previous experiment except that the stand electrode is grounded. The dosage for the person on the platform is increased, but the hand on the stand electrode will feel nothing, or almost nothing.

c. Fig. 4. The same arrangement except that the ground wire is taken off the stand and the person, who is not on the platform, seizes the ground wire with his second, preferably bare, hand. In this case he receives a very strong electrical dose because he is a part of the grounded electrode and the whole current passes through him without loss.

d. Compare Fig. 5 with Fig. 2. In Fig. 5 the whole current passes through the person on the insulating platform; in Fig. 2 he is only a shunt and according to the law of derived circuits he gets a much smaller dose than in the former case. If the stand electrode is grounded the person gets an absolutely stronger dose but a relatively smaller one, because the resistance in the main circuit is much diminished while the resistance in the shunt has not changed.

All of these experiments, those of E. Mach and my own, leave no doubt that from the standpoint of conductivity and resistance static electricity follows the same laws as the galvanic and faradic currents. Static electricity as employed in medicine is no surface charge, but furnishes a current with the same principal properties as other electric currents.

I am prepared to hear another objec-

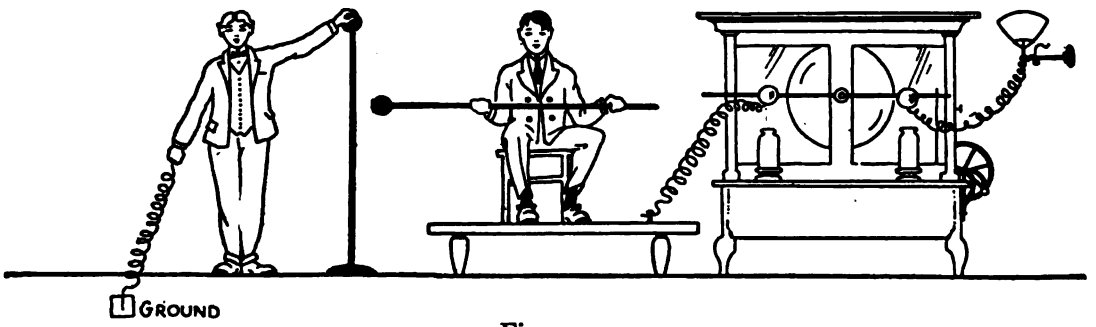

Figure 4

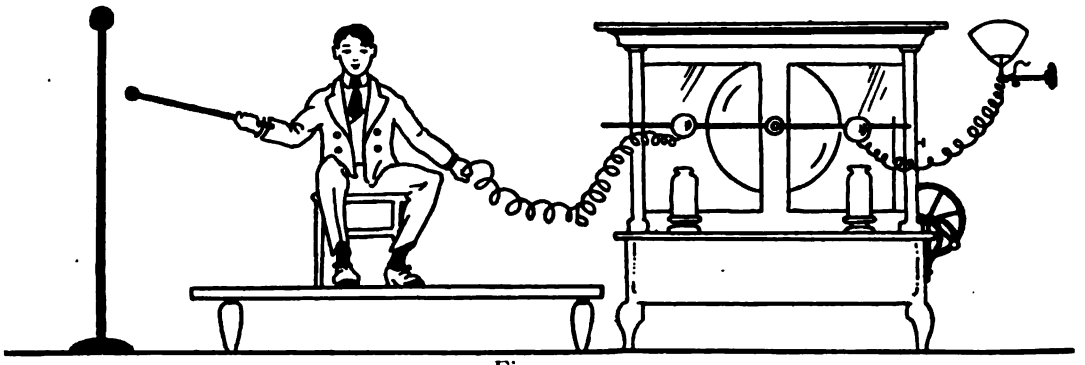

Figure 5

tion which is based upon Faraday's well-known experiment. A bag, made of gauze or cotton, is supported on an insulating platform and a silk string attached to it by means of which it can be turned inside out; the electricity is always found to reside on the outside. The most satisfactory explanation of this phenomenon, which solves the apparent contrast, I find in an article of von Luzenberger,* who writes: "The law reads: From the repulsion which similar electricities exert upon each other, it follows that the electricity of electrified conductors can only reside on the outside, never inside. The experiments to prove this are, first, if a hollow sphere with an opening is electrified and then connected to an electrometer, the outer surface shows the presence of a charge, the inner one is unchanged; secondly, if a cotton bag upon an insulating platform is also charged and measured for electricity, then turned inside out with insulating instruments, the charge is always found to reside on the outside, never on the inside."

In these experiments, as Professor Schatzky says, the electricity is at rest, while in our therapeutics we always work with electricity which we produce and let pass. This also is not in conformity with the facts. Between Faraday's experiment and our therapeutic charge there is only a difference in quantity; in the experiment with the bag we touch the bag with the electrified glass rod and from this charge electricity flows into the surrounding air which counteracts this flow; nevertheless after a certain time the cotton is perfectly discharged. Now, what do we measure with the electrometer? Nothing but the tension. In a good conductor there is no tension; if we put the terminals of a voltmeter on an equally thick and equally dense metallic conductor of a strong industrial dynamo current, the electrometer will indicate no electricity; we always have to measure at the *ends* of an interposed resistance in order to get potential differences. In the metallic balls of the collectors and in the cotton of the above-mentioned bag, we no doubt have electrical waves, but these waves appear to us as tension only where they find a resistance, and this is at the surrounding atmospheric air. Faraday's law therefore should not read: "Tension electricity collects on the surface," but should be changed to "Electric tension is measured at the surface only," — which does not invalidate the claim that the motion of electric masses which we cannot accurately measure as yet, is present on the inside.

We may again look at the matter from a different view point. Electro-

*A. von Luzenberger. "Static Electricity in Therapy since the 18th Century." Zeitschrift für Electrotherapy, August, 1903.

chemistry teaches us that an electromotive force of 1.47 volts is necessary to decompose water. Current volume is of minor consideration here inasmuch as the quantity of the decomposed water is directly proportional to the volume (amperage). If we should take a battery of one thousand Daniell cells — a Daniell cell has an E. M. F. of about one volt — connected in parallel so that the volume would increase, but not the E. M. F., then water could not be decomposed electrolytically with this large apparatus because there is not present sufficient electromotive force to break up the molecule. The dynamo current, as used in electric railway systems, has an electromotive force of say 600 volts, which is high enough so that one receives an electric shock by touching one of its wires. But if the wire be insulated one may touch it with impunity.

Not so with the static current. If the wire or rod that carries the static current is covered with the same insulating material which was found sufficient for the trolley current it would avail nothing with the static current. If we approach the insulated wire with our hand a spark will leap across. The static current is able to accomplish this on account of its much higher electromotive force. We need not even touch the wire, the current overcomes the high resistance of the dielectric air and reunites with the opposite electricity in a disruptive discharge; it overcomes the high resistance of the dry skin and causes a muscular contraction below the skin.

I do not think any more argument is required to justify formulation of the following rule: *The quantity of chemical changes increases with the current-strength (amperage), the penetrating power increases with the electromotive force (voltage).* The static current is one of enormous voltage, but of very small amperage, and this small amperage prevents us from demonstrating by chemical changes that the static current, *de facto,* not only penetrates, but penetrates deeper than either the faradic or galvanic currents.

A NEW FILM-CARRIER AND INDICATOR FOR DENTAL RADIOGRAPHY WITH PROJECTION UPON A HORIZONTAL PLANE

BY SINCLAIR TOUSEY, A.M., M.D., OF NEW YORK CITY.

Surgeon to St. Bartholomew's Clinic.

THE principle of horizontal projection for X-ray pictures of the teeth and maxillæ has been used by Kienbock and Holzknecht of Vienna, and was published by Costa in a review of European radiology, *Archives d'Electricite Medicale,* March 10, 1905. It consists in placing a film or plate horizontally in the mouth and placing the X-ray tube so far above this plane that the shadow of the plate represents the actual length of the teeth. Roughly speaking the teeth are vertical, and if the rays fall at an angle of 45 degrees, the rays form the hypothenuse of a right angled triangle of which the other two sides are the tooth itself, and the image of the tooth upon the plate.

According to a geometrical law the

two sides are of equal length when the angle is 45 degrees, as in this case. Of course the image of the apex of the tooth will appear magnified owing to the divergence of the rays and the distance between the apex and its image upon the plate. (Figure 6.)

By another geometrical law this increase in the apparent thickness of the apex of the tooth is the same fraction of the actual width of the tooth, as the distance from the apex of the tooth to its image is of the distance from the anti-cathode to the image. Thus if the tube is so near that the distance from the apex of the tooth to its image is one-tenth of the total distance from the anti-cathode to the film, the width of the image would be one-tenth greater than the actual width of the tooth.

In actual practice it is desirable to have the tube farther away, and this magnification is reduced to so small a fraction as to become insignificant. With the tube at the proper distance above or below the plane of the film there is no magnification at all of the length of the tooth, and a picture made in this way enables us to measure the tooth accurately. (Figures 1 and 2.)

My own device was demonstrated in public for the first time at the annual meeting of the New York State Dental Society, Albany, N. Y., May 13, 1905. It consists of a stiff card 2½ inches wide and 5 inches long, covered at one end by a sheet of rubber dam which forms a pocket into which the film, wrapped in black paper, may be slipped. This end is placed horizontally in the patient's mouth and held there by tightly closing the lips and teeth. The part of the card which projects from the patient's mouth has a clamp of aluminum, which may be turned to either side or straight, and carries a thin aluminum rod which is held always at the proper angle to the plane of the film. Diagrams of the teeth are printed upon both the upper and lower surface of the card and serve to indicate the position to which the aluminum pointer must be turned laterally. (Figures 3 and 4.)

For radiographing the upper jaw, the patient sits erect with the film-carrier in his mouth. The pointer is turned to the position on the diagram where the teeth of chief interest are located, and the X-ray tube, in a Friedlander shield, is brought into a position to correspond with the position of the pointer. In other words we have an aluminum rod which points to the spot where the anti-cathode of the tube should be placed. For the lower jaw the film-carrier is turned down and it will often be found desirable to tilt the patient's head somewhat in order to cause the indicator to point to a spot at which it is practicable to place the X-ray tube. It is hardly necessary to add that since the incisor teeth are an inch behind the pivot of the indicator the anti-cathode must be placed in corresponding relation to the pointer.

The value of the film-carrier and indicator consists in the fact that it readily and securely holds the film in position without placing the finger inside the patient's mouth. The proper relation of tube and film are very readily secured. The picture obtained gives an exact measure of the length of the teeth, and most important of all: the teeth of the whole side or front of the jaw may be shown on one film. By using an unusually wide film it is practicable to secure a picture on one film of the teeth of both sides of the lower jaw with very good definition and also of the incisor teeth, but the latter of course would be a confused overlapping mass. The radiograph of the upper jaw may show all the front teeth or if taken at the side all the side teeth and the antrum of Highmore. To get the wisdom teeth either upper or lower, the back of the film must be held far back in the mouth, but this is less unpleasant to the patient than the more usual way of pressing a small

Figure 1
Tousey's film carrier and indicator for dental Roentgenography.

Figure 2
Tousey's film carrier and indicator for dental Roentgenography.

Figure 3
Taking a Roentgenograph of the upper incisor and canine regions with Tousey's carrier and indicator. The Roentgen Ray tube is enveloped in an opaque shield which protects the patient and the operator from the rays.

Figure 4
Taking a Roentgenograph of the right upper lateral half of the jaw with Tousey's film carrier and indicator.

Illustrating a New Film Carrier and Indicator for Dental Radiography with Projection upon a Horizontal Plane — *Tousey*
The Archives of Physiological Therapy — September, 1905

Figure 5

Boy 13 years of age, both lower second bicuspids unerupted. The bicuspid which was present was supposed to be a second bicuspid from its large size. Roentgenograph shows germ of missing tooth and that *this* is the second bicuspid.

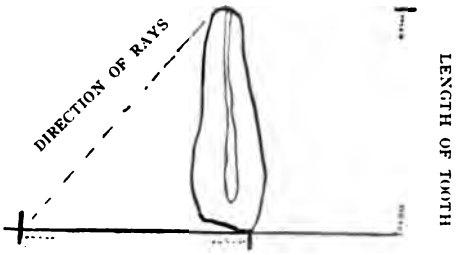

Figure 6

Figure 7

Film held against inner surface of gums.

Figure 8

Unerupted superior canine, temporary canine still *in situ*: taken with Tousey's film carrier.

Illustrating A New Film Carrier and Indicator for Dental Radiography with Projection upon a Horizontal Plane — *Tousey*.

film against the inside of the jaw far enough back for that purpose. The greater ease with which it is practicable to show the entire vertical width of the lower jaw is an additional advantage. (Figures 5, 7, and 8.)

The illustrations show the method of using the film-carrier and indicator, and a picture taken by this method and another of the same case by the older method. The latter gives slightly better detail and is to be preferred in many cases on that account.

THE DIFFERENTIAL DIAGNOSIS BETWEEN CENTRAL AND PERIPHERAL MOTOR LESIONS BY ELECTRICITY *

BY ALBERT C. GEYSER, M.D., OF NEW YORK CITY.

Radiographist and Radiotherapist at Cornell University Medical College; Member American Medical Association, American Electro-Therapeutic Association, New York State Medical Association, Harlem Medical Association, Medical Society of the Borough of the Bronx, Medical Society of Greater New York, Manhattan Dermatological Society, etc., etc.

The Cell Doctrine

NEARLY one-half of a century has passed since Virchow in his "Cellular Pathology" gave birth to the idea that every animal appears as a sum of vital units, each of which exhibits in itself all the characteristics belonging to life.

Not only that, but he maintained the thought that each cell sprang from a preceding or parent cell by division, budding, or otherwise; he believed that the character and unity of life are referable not to any single locality of a higher organization — for example to the brain of man — but rather to the definite, constantly-recurring arrangement which every single element bears to itself.

Taking the correctness of this view for granted, the composition of a larger body of the so-called individual, must always depend upon a social arrangement; it represents in fact a social organism, in which there is a mass of single existences, related to one another in such a way, that every element has its own special activity and each, when excited to activity by other parts, does its work and performs its functions of and by itself.

If this idea is correct it must apply not only to the body at large, but also to each organ, to the nervous system, even to each cell entering into the composition of any tissue.

During the last few years it has been possible to approach the nervous system with instruments of immense precision, with better recorded observations of diseases of the nervous system, aided by the refutation or confirmation of previously existing data, thereby arriving at the newer conception of the neuron as a unit.

In fact only after it had been clearly shown that the nervous system, like all other tissues, consists of elements more

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**Read before the Medical Society of the Borough of the Bronx, New York, N. Y., January,* 1905.

or less isolated and independent, and connected directly with one another apparently only by contact, concrescence, or protoplasmic bridges, and after we had learned to recognize the different structures which belong to the single elements, could the study of the functional units in the nervous system be satisfactorily approached.

The Nervous System; Central and Peripheral

In describing the nervous system, convenience of comprehension has caused us to divide the entire system into two grand divisions; yet it must of course ever be borne in mind that those two portions are anatomically as well as physiologically *one* system.

The central nervous system includes the crebrum, cerebellum, and pons, or that portion inclosed within the cranium proper, while the peripheral portion includes the spinal cord, the nerves, and sympathetic system. (See Fig. VI.)

By virtue of its continuity the nervous system puts into connection all the other systems of the body.

Conforming as it does in shape to the framework of the body, its branches extend to all parts.

These branches *form the pathways* over which nerve impulses travel *toward* the central system, and in consequence of the impulses received, there pass out *from* the central system other impulses to the muscles and glands. (Fig. VII.)

In order to maintain harmony between the activities of the several systems composing the body, it is at once apparent that the pathways leading *to* the central nervous system, the central system itself, as well as the paths conducting impulses *from* the center to the periphery, must be in a normal state to perform their particular function.

A Short Review of the Anatomy of a Neuron

By the term neuron we understand the entire mass under the control of a given nucleus forming both the cell body and its branches.

The cell body contains the usual granular material with a nucleus and nucleolus.

Nerve cells differ according to their physiological function in the number of branches arising from them.

Most cells possess one principal branch, which when spoken of alone is called the nerve-fiber, but when considered as the outgrowth of the cell body from which it originated, it is called the axone; this axone usually has branches; these branches are designated as collaterals; the distal ends of the axone divide into finer branches forming the *terminal arborization.*

Contrasted with this principal outgrowth are the other branches of the cell, which are of course individually much shorter and which divide dichotomously at frequent intervals forming a tree-like appearance, hence their designation *dendrites.* An axone in the central system may reach from the cerebral cortex to the lumbar enlargement, while the longest nerve fiber of the peripheral system reaches from the lumbar enlargement to the toe; the longest fibers are found in the spinal ganglia of the lumbar region where one axone passes to the bulb while another of the same cell passes to the skin of the toes, thus spanning the entire length of the body.

Some of these fibers are medullated, while others are not; most of the nonmedullated fibers are found in the sympathetic system although a few nonmedullated fibers are present in the cerebro-spinal system. The function of this medullary sheath is at best problematical; it has been suggested that this coat acts as an insulation, but there is hardly any warrant for such a conclusion. That, however, it may act to the nerve fiber as the periosteum does to the bone, appears more probable.

The ganglion cell with its dendrones and the axis cylinder with its terminal fribils together form an anatomic and physiologic unit — A Neuron. (Fig. I.)

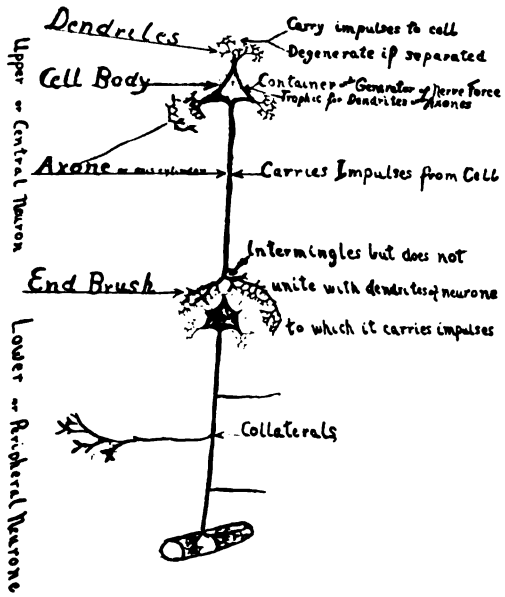
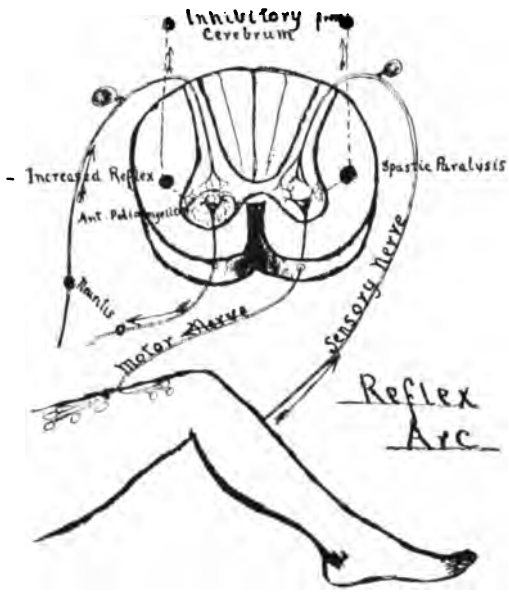


Figure I



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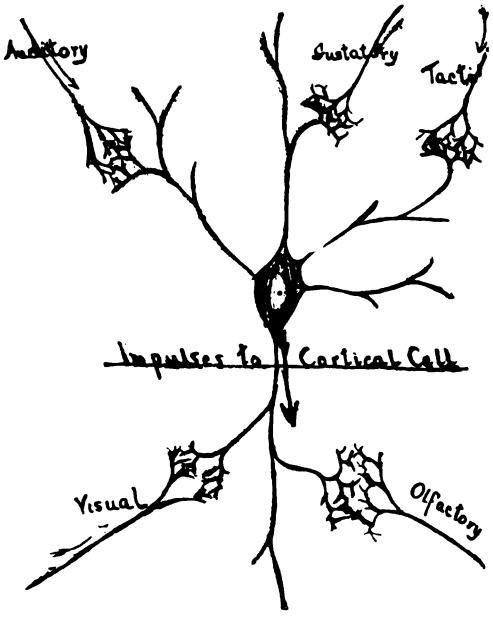


Figure III

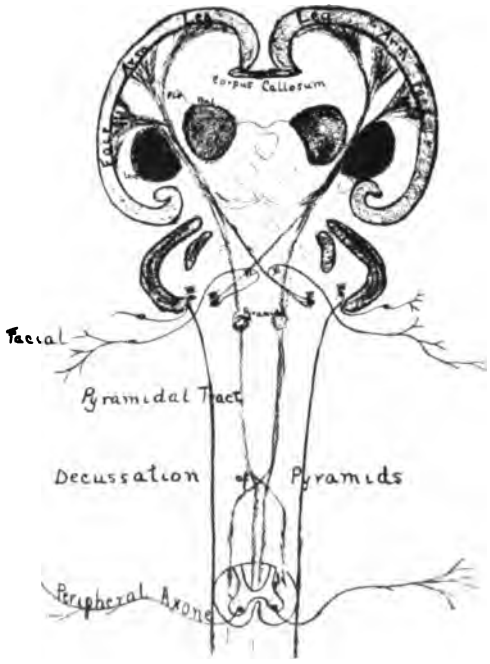


Figure IV

Illustrating Differential Diagnosis of Motor Lesions — *Geyser*

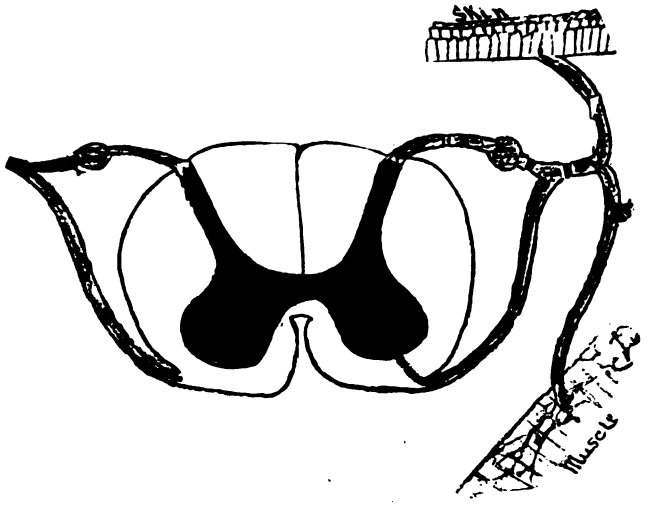


Figure V

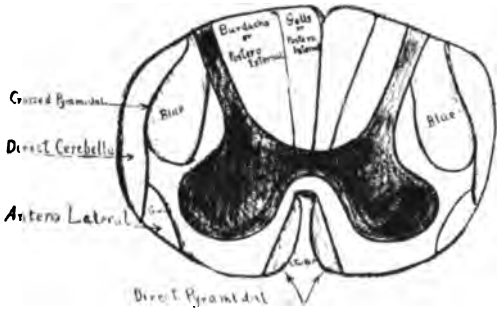


Figure VI

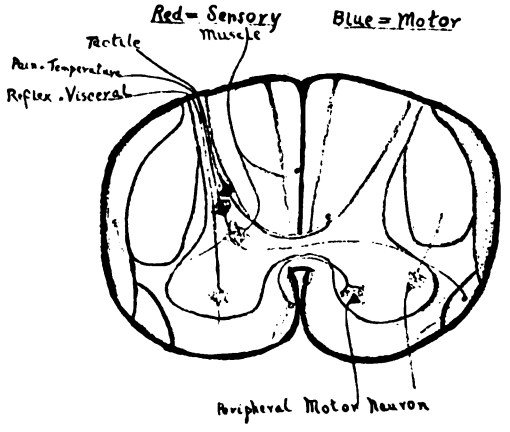


Figure VII

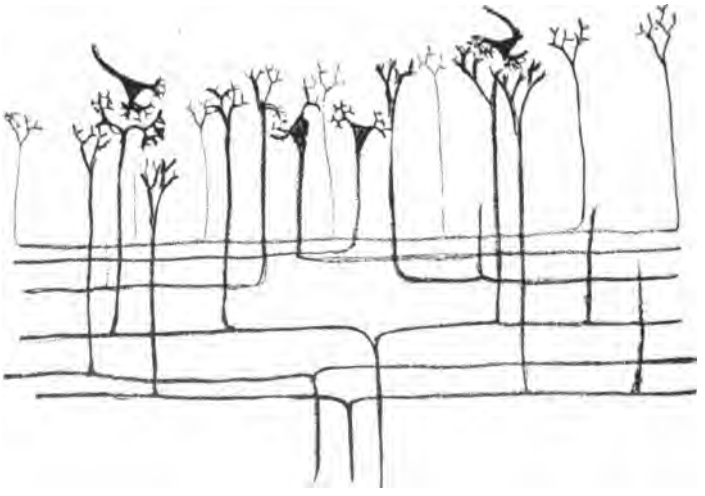


Figure VIII

Illustrating Differential Diagnosis of Motor Lesions — *Geyser*

Every nervous pathway is made up of a series of such neurons, communicating with one another.

There does not appear to be any direct anatomic continuity in these neurons, which communicate with one another like cog wheels; the terminal fibrils of the axis cylinder of one neuron inserting themselves between the arborizations of the cells of another neuron.

The brain, spinal cord, peripheral nerves, and sympathetic system are composed exclusively of neurons of this character and their articulations.

It is thought that the transmission of an impulse is effected from one neuron to another by some protoplasmic elongation, or contraction and relaxation, or vibratory movements of the terminal filaments. Such impulses are carried to the cells by the dendrones and away from the cells by the axis cylinders. Every neuron probably acts in relation with several others; the most extensive communication being made possible by the innumerable dendrones and collaterals. (See Fig. III.)

The Pyramidal Tract

Located in the central convolution of the brain is the motor cortical zone, the cells located in this area with their axis cylinders form first, the corona radiata, then by converging enter the internal capsule where they are found in the knee and the anterior third of the posterior limb. This portion of the ventral peduncular fibers emerges at the posterior border of the pons in a compact bundle, known as the *pyramid* and continues its way down the spinal cord as the *pyramidal tract.* (See Fig. IV.)

Most of the fibers undergo decussation and occupy the lateral column, while the smaller uncrossed portion remains in the anterior column. This tract contains the longest fibers of the corona radiata, and can be followed in the lateral column of either side as far down as the conus medullaris. This tract forms the *central motor* pathway.

The axis cylinder or nerve fiber of this central tract splits up along various levels of the brain and spinal cord into its terminal fibrils, which surround the dendrones of the ganglion cells of the *peripheral* motor neuron located in the various ganglionic enlargements of the spinal cord.

The nerve processes of the *peripheral* cells emerge as nerve roots from the brain and anterior horn of the spinal cord of the *same* side and are continued as motor fibers to the muscle, where they finally break up into their terminal fibrils among the individual muscle fibers.

The *central* motor neuron, therefore, *undergoes decussation* while the *peripheral does not.*

The impulses which originate in the cells of the cortex, are transmitted to the muscle, through the pathway formed of these two neurons, and from the decussation of the central neurons it follows that the cortex of each hemisphere controls the muscles of the *opposite* side of the body.

Every neuron cell exercises a trophic influence on its processes including the long axis-cylinder process. If this influence is destroyed, the corresponding nerve fiber undergoes degeneration and the ganglion cell itself suffers degenerative changes if the continuity of the neuron is interrupted.

The cell of the peripheral neuron, in addition, exercises a nutritive influence on the muscle fibers to which it is distributed.

The Sensory Pathway

The function of the sensory pathway is to conduct sensory impressions from the periphery to the center.

The peripheral sensory neuron complex of the extremities and trunk is contained in the sensory fibers of the peripheral nerves.

From its various distribution to the skin and other parts it continues its course to the spine through the fibers of the various plexuses and ends in the cells

of the spinal ganglia, without directly entering the spinal cord.

The cells in the spinal ganglia differ from other cells in that they possess two axones, giving the appearance of the fiber entering at one end of the cell and leaving at the other; these fibers, by which the nerve leaves the cell in the spinal ganglia, collectively form the posterior root, and as such, the sensory peripheral neuron finally reaches the spinal marrow, the posterior roots entering in two separate parts into the posterior columns that lie between the posterior horns. After its entrance into the spinal cord each root fiber divides into an ascending and descending branch, which soon divide to communicate with the cells in the gray matter of the spinal cord, as well as sending collateral branches upward in the posterior columns known as Burdach's and Goll's columns, where are located fibers controlling tactile sense and muscular coördination. These fibers pass upwards through the entire length of the spinal cord and finally break up, surrounding cells in the nucleus of Burdach and Goll located in the medulla oblongata. *The terminal divisions of the* PERIPHERAL sensory neurons take place about the nerve cells lying in the following regions:

First, in Goll's and Burdach's nuclei in the medulla.

Second, in the various portions of the posterior horn.

Third, in the middle zone between the anterior and posterior horn.

Fourth, in the columns of Clark.

Fifth, in the anterior horn.

The CENTRAL sensory neuron complex begins of course at the ending of the peripheral neuron in the regions mentioned in the first four above-noted distributions. (See Fig. VIII.)

Those fibers which enter the posterior root zone and communicate with cells situated in (noted fifth above) the anterior horns, are especially concerned in reflex action.

Up to this point the distribution is fairly well settled, but the further course of the central sensory tract is still a matter of dispute. By some authorities it is maintained that after the central sensory neurons reach the medulla oblongata that one, two, and even more neurons are required before the cortex of the cerebrum is put into communication with the periphery.

The Reflexes

By a reflex action we mean a motor act performed automatically in response to a sensory impression.

The entire act is confined to the *peripheral neurons* which therefore form the reflex arc. (See Fig. II.)

This reflex arc is composed of a sensory portion contributed by the *sensory peripheral* neuron, a motor portion contributed by the *motor peripheral* neuron, and a *connecting link* formed by a *branch of the sensory neuron* after its entrance into the spinal cord; the latter is known as the reflex collateral.

The course of the cutaneous and tendon reflex arc is better known than that of any other. We distinguish a short and a long reflex arc.

The short reflex arc consists of a collateral which passes directly from the posterior column through the posterior horn to the cell in the anterior horn; under this head are included the plantar, patellar, and spinal reflexes.

The long reflex arc is formed by the reflex collateral splitting up about a cell in the anterior horn; from this cell an ascending and a descending branch, with several collaterals, pass to one or more motor ganglion cells which may be situated at various levels of the anterior horn. This gives the possibility of reflex movements being transmitted to more remote muscle groups.

Of the more complicated reflex arcs we have little definite knowledge as the pharyngeal, nasal, bronchial, conjunctival, pupillary, and others.

There are, however, a few of the more important reflexes that should not go unnoticed. Locomotor ataxia, for instance, even in the beginning, may be diagnosed by the absence of the patellar reflex, the absence of the pupillary reflex, and the presence of the swaying of the body with the eyes closed; here, then, we have three reflex arcs, any one of which should cause a further investigation, while the presence of any two of these would strongly point to an assured diagnosis of tabes dorsales.

In order to elicit the presence or absence of the knee-jerk, the patient should be placed in a sitting posture on a high stool so that both legs are free and not resting upon anything, the patient should then be instructed to link his hands together, close his eyes, and the moment he feels the blow struck upon his patellar tendon to exert a strong pulling force with both hands; this of course simply assists in diverting the patient's attention, and all undue strain or tension is thereby removed from his lower extremities; it is also well to bear in mind that, with some normal individuals the knee-jerk is absent. This absence of the knee-jerk was first described by Westphal, hence its name, — The Westphal sign.

The Argyll-Robertson pupil is a loss of accommodation to light but not to distance. It may be obtained best in a dark room by suddenly flashing a small electric light, when a contraction of the pupil should occur; the absence of this contraction to light furnishes a valuable reflex diagnostic sign.

The Rhomberg symptom is usually present early in this disease and is due to loss of muscular coördination. Place the patient with his heels and toes together, body erect, order him to close his eyes, and very shortly a marked swaying of the body will take place. This swaying will become so violent that the patient must be guarded lest he fall. The achilles reflex in some cases of locomotor ataxia, as well as in paresis, is absent sometimes even earlier than either of the previous ones.

In lesions of the peripheral nervous system, we have then, generally speaking, a loss of reflex action, while in diseases of central origin we expect to be assisted by an undue increase of these reflex phenomena.

The patellar reflex may be markedly increased; the increased reflex act, however, is best shown by the ankle reflex, especially if clonus is present. Take the heel of the patient in the palm of the hand and with the other hand make sudden pressure upon the ball of the foot so as to cause a strong flexion of the foot; as long as this flexion is maintained the ankle clonus, if present, will be manifested. Such an increased action then would indicate a lesion of central origin with possible secondary changes in the pyramidal tracts, as in lateral multiple sclerosis, or as the result of apoplexy.

The cutaneous or superficial reflexes are not so well understood; attention should, however, be directed to the Babinsky phenomenon. Under normal conditions, if the sole of the foot be irritated, excepting in very young infants, there is a flexion of all the toes, but in diseases of the pyramidal tracts or apoplexy, when the sole of the foot is gently irritated, there is a gradual extension of the big toe, sometimes of all the toes; this becomes, therefore, a valuable reflex sign in cases of coma, for if present, it will be pathognomonic of cerebral apoplexy.

Last, but by no means least, is a condition of the sympathetic system along the entire length of the spinal column. For the past five years I have examined over a thousand spines for this sign, for I know of no other means or symptom capable of furnishing such unerring evidence of disease as the spinal sympathetic system.

No matter how recent an injury has taken place, no matter how long ago or

how obscure the symptoms of a chronic ailment may be, as long as some portion or organ of our economy suffers, a reflex center corresponding to that portion or organ will surely be found somewhere in the spinal cord.

Some of these spinal centers are well known; others are more or less obscure. The sense of sympathetic painful areas, however, comes to our aid, but in eliciting pain, we are obliged to rely upon the statements of perhaps a nervous patient whose sense of pain may be perverted and therefore misleading.

Fortunately, I am able to call your attention to a system that will at once commend itself to you, for its simplicity, as well as for its accuracy.

How to Find the Painful Centers

For this purpose, the patient's back is bared and a high tension faradic coil is brought into use. Before applying the current the coil should be tested with a four to six inch Geissler tube. If the coil is capable of illuminating the tube, then it possesses the proper amount of penetrative power to be useful for our purpose. In my earlier work, I encountered some discouraging results, due entirely to faulty coil construction. Since then, however, I have had the Kidder Manufacturing Company of New York wind a specially suited coil for me. They have, since then, continued to wind their high tension outfits in this manner. However, any faradic coil, as previously stated, capable of illuminating a four to six inch Geissler tube, is proper for this work.

One pole of the battery (it does not appear to make any difference which) is attached to a six by six inch moist electrode, and applied in front over the epigastric region; the other, a smaller electrode, two by two inches, well moistened, is passed lightly over the spinal column, with a current strength only sufficient to be agreeably felt by the patient. Pass this electrode up and down the entire length of the spinal column with ordinary pressure, eight to ten times, then remove the electrodes when it will be found that we have boldly outlined upon an otherwise white background, *vivid red spots.*

These spots for some few minutes after the current is removed tend to become even more prominent and more sharply circumscribed. If we now make digital pressure upon any of these indicated spots, we shall find sensitive or painful areas, while no pain will be complained of in the intermediate region.

These pictures in a short time become almost pathognomonic of certain ailments and with an exactitude that is surprising point to the location of the particular region or organ involved, *so that the observer can make a diagnosis from the reflex centers involved.*

The explanation of this phenomenon is neither mysterious nor difficult, if we remember the nerve connections just prior to their entrance to or exit from the spinal canal; and, if we bear in mind the effect of irritation upon any tissue, then we have a clear conception of why the sympathetic nervous system should respond so readily to *our irritation,* and why the *more* irritated centers (from other causes) should respond *before even the normal tissue appreciates the irritation produced by the current.*

The rather brief and incomplete description of the anatomy of the neuron system, which occurs earlier in this article, will, however, aid us in appreciating the lesions that commonly occur and especially assist us in determining as to whether a certain motor lesion is located in the central or in the peripheral nervous system.

From the foregoing anatomy it will be apparent that the *prognosis* as well as the *therapeutics* in a given case will be materially influenced by the *diagnosis;* as to whether we are dealing with a lesion in the *central* or *peripheral* tract.

It will therefore be my pleasure to

point out to you a few definite land marks and as the physician is obliged to approach his diagnosis by certain symptoms presented by the patient, we will begin with a differential diagnosis chart of *symptoms* as presented by the patient.

DIAGNOSIS CHART

When the lesion is in the central part of the motor tract, producing central palsies:	*When the lesion is in the peripheral portion of the motor tract, producing peripheral palsies:*
1. Palsy is an extensive one.	1. Palsy is confined to an individual muscle or to a few muscles.
2. Palsy is not attended by atrophy of muscles.	2. Marked and rapid atrophy takes place.
3. There is no alteration in the electrical irritability of nerves or muscles.	3. Marked electrical changes occur, showing the reaction of degeneration.
4. The deep reflexes are present and, as a rule, very much exaggerated.	4. The deep reflexes are diminished or absent.
5. Muscles show an increased tonus or spasticity.	5. Muscles are lax or limp as when passive motion is made.

It will be seen that there are five differential elements represented in the above chart; we will consider them seriatim.

1. Why is palsy due to a central lesion an extensive one, while a palsy due to a peripheral lesion is confined to an individual or to a few muscles?

If you will recall how the central motor tract, beginning in the corona radiata and comprising a number of bundles, passed into the internal capsule, it will be clear why only a very small lesion in the internal capsule would cause a widespread paralysis; while if the lesion be situated in the peripheral motor tract only that muscle to which the particular neuron is distributed would be affected.

A very large lesion indeed would be required to cause a paralysis of all the muscles of even one extremity.

It will be safe to assume then, whenever you find only one muscle or the muscles which are supplied by the same nerve, in a state of palsy, that the lesion will be located in the *peripheral* portion of the motor tract.

2. Why should atrophy be absent in the central lesion while present in a marked and rapid degree in a peripheral lesion?

Bearing in mind the fact, that the *nuclear origin* of the *motor* nerves exerts a *trophic influence* upon the axone as well as the *muscle* which it supplies; lesions of the central tract do *not* therefore, interfere with the *trophic* center and so have *no effect* upon *the nutrition* of the paralyzed muscle, which, therefore, does *not* suffer atrophy, only in so far as non-use may produce it. (Fig. V.)

Reaction of Degeneration

3. There is in medicine, especially in diagnosis, no other agent which is capable of furnishing so much valuable and unerring information as the faradic and galvanic currents, but unfortunately the use of these currents seems to be shrouded in underserved mystery. The electrotherapist is in possession of certain facts regarding the action of these currents in health and in disease; he is not in possession, however, of the complete scientific rationale of this action, therefore, in order to make his pseudo science appear scientific, he uses the cloak of mystery and indefinite explanations to cover his ignorance. It is hardly to be wondered at that the profession in general has taken so little interest in so valuable an agent.

To test for the reaction of degeneration we make use first, of the faradic current. Apply one pole, it does not matter which, over the region of the spine from which the nerve originates which is about to be tested; place the other pole upon the same muscle, on the *opposite* side of the body from the one which appears palsied. Gradually increase the current and slowly move the electrode over the entire length of the *sound* muscle until a distinct contraction is *seen* and *felt*, then transfer this same strength of current to the *diseased* muscle. If the paralyzed muscle contracts the same as the sound muscle, you may be sure you are dealing with a paralysis of *central* origin; if, however, the muscle fails to contract, it is an equally sure indication that the lesion exists somewhere in the peripheral tract.

Next if we desire to determine the extent of the lesion, we use the galvanic current, any galvanic battery of 15-20 cells in good working order will answer the purpose.

Apply the poles as before and, with the meter in circuit, note the reading on the meter, or the strength of current necessary to obtain a contraction of the sound muscle; transfer the muscle electrode to the muscle in question, again close the current and note the effect. If the muscle contracts as the muscle upon the sound side, then we are dealing with a lesion of *central* origin; if it fails to cause contraction then as before we have a *peripheral* lesion. With a current of medium strength, the contraction should always be stronger when the negative pole is placed upon the muscle and the current closed. Should, however, the opposite be found to be true, viz.: that the positive pole upon *closure* of the circuit produces a stronger contraction than the negative, we shall have then, a reversal of what has been accepted as "The Normal Formula," or a *partial reaction of degeneration.*

In testing with either current, however, the contractions should be quick and prompt for the *normal* state and in *central* lesions; while they will be found sluggish or wave-like, or entirely absent in *peripheral* lesions. When the contraction is sluggish or wave-like, then this condition constitutes a quantitative reaction of degeneration; if the normal formula has been reversed, a qualitative reaction of degeneration.

4. The reflex arc is composed entirely of peripheral neurons, and three sets complete this arc; a sensory nerve to convey the stimulus applied, the motor ganglion cell, and a motor fiber to convey the impulse to the point of stimulation. Should any part of this arc be destroyed no reflex action could take place. An absence or even serious diminution of the reflex act should be construed as a lesion in the *peripheral* system. The *central* motor nerve fibers from the cerebrum, besides conducting impulses to the motor ganglion cells in the anterior horns, exercise the office of inhibiting and controlling excessive reflex action. When, therefore, we find upon examination that the reflexes are markedly *increased,* it is at once a sure guide to the *centrally* located lesion.

5. As all *voluntary* impulses are controlled from the *central* motor system, it follows that an irritative lesion in this tract would cause additional *tone* or diminished *relaxation,* causing *spasticity* of the muscle under examination, while, on the other hand, if we find that the suspected muscle is *lax* and *limp,* it may serve to indicate that the *peripheral* motor neuron is incapable of conducting sufficient impulses to maintain even normal tone.

We have, then, five cardinal points upon which to base our diagnosis in any given case; these points being diametrically opposed to each other in the two conditions under consideration, should make the differential diagnosis of a *central* or *peripheral* motor lesion simplicity itself.

THE CURE OF APPARENTLY PERMANENT DEAFNESS BY VIBRATORY STIMULATION

BY A. K. SCHOLL, M.D., OF PHILADELPHIA, PENNSYLVANIA.

MECHANICAL vibratory stimulation, that of late has proved so valuable an adjunct in the treatment of disease, finds a most promising field in aural affections and in the diseases of allied structures.

We know that the great usefulness of vibratory action lies in the fact that its power for good is dependent upon the starting of impulses along the sympathetic nerves, and that these impulses are sent to the proper centers for delivering an increased amount of blood to the affected part.

The method is efficient, because the vibrations imparted, closely resemble the natural bioplasmic movements.

Where there exists lowered vitality of a part, or an anemic or ischemic area, I have found that vibratory treatment, for a brief period at each visit of the patient, will very shortly stimulate the structure to greater activity and thus relieve conditions that have defied attempts at medication alone.

I wish to briefly mention a few of the many cases that I have treated by mechanical vibratory stimulation. All of these patients had suffered from deafness and when they consulted me, I was informed that for years their hearing had been completely lost. Indeed they were more than skeptical as to the attainment of any favorable result from any measure that might be employed and they willingly submitted to treatment, if the slightest hope could be held out to them.

Most of the patients showed a generalized and localized anemia. The tympanic membrane was blanched and in a catarrhal state. It must not be forgotten that all of these patients were more or less debilitated, so that constitutional measures were at once instituted. I set to work to mechanically influence the affected areas by vibratory stimulation applied to the mastoid region, to the cervical glands and along the lower border of the inferior maxilla to the mental process. At the same time I employed topical applications to the nose, throat, naso-pharynx and the eustachian tubes. The cases referred to are as follows:

Case I.—Mrs. L., since 1896, had suffered from tinnitus and marked impairment of hearing. She was treated for several years by a number of physicians with indifferent results. As the affection progressed, her condition became more rebellious to treatment and she was unable to perceive sounds. Through her family physician, I was consulted on October 9, 1904, and at this writing she says that she is "able to appreciate the sermon at church with perfect satisfaction."

Case II.—Mr. M. about six years ago contracted "grippe," that impaired his hearing, which had slowly but steadily gotten worse. In November, 1904, when he first came to me for treatment he deemed it necessary to give up his work, as his faulty hearing would not permit his holding a position. After five months' treatment, he considers his hearing almost wholly restored.

Case III.—Child, aged 12. At the age of six, she suffered an attack of scarlet fever. Since that time she has been unable to understand statements addressed to her, and there has been a con-

stant discharge from the ears. She consulted me last November, and on April 1st of the present year, the discharge had entirely ceased and the hearing is returning to the normal very rapidly.

Case IV. — A lady, aged 30, who had been apparently hopelessly deaf since childhood consulted me but recently for what she regarded an incurable aural affection. She had been treated by several physicians, but her condition was becoming surely more serious. When I saw her she could hear no sound and I got the history of the case by writing my questions, she answering them in the same way. There was a continuous discharge from the ears, and the patient was markedly despondent. After six months' treatment she could hear and appreciate ordinary conversation. Subjective sounds had ceased, the discharge disappeared and the despondency has been replaced by the woman's usual cheerful manner.

Space forbids the recital of other equally interesting cases where the mechanical vibratory stimulations relieved deafness that was regarded as irremediable. Of course all sources of irritation acting reflexly must be first removed. I agree with those physicians who believe that this form of treatment increases nutrition by stimulating secretion through the vasomotor, the viscero-motor, and the secretory systems.

ROENTGENOTHERAPEUTIC TECHNIQUE

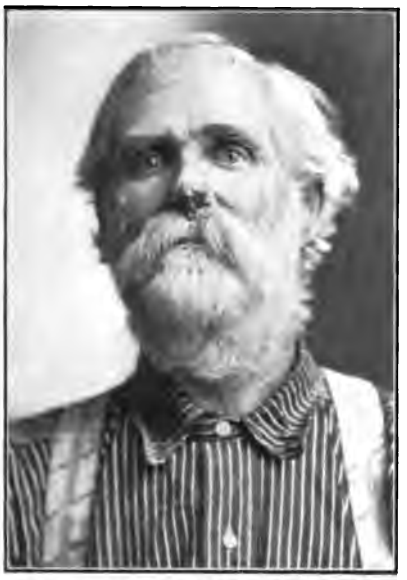
BY W. L. BROSIUS, M.D., OF GALLATIN, MO.

WHERE you have a commercial current, coil of known energy, volt and ampere meter, the administration of radio-activity can be directed with a certainty on the electrical side; which leaves the principal subject for thought, on the part of the operator, the vulnerability of the tissues to be dealt with. But where you have only a static machine from which to secure your energy (subject to the vicissitudes of a static), you have a much more complex problem; and I believe must exercise more skill and care to secure results.

The patients whose photographs accompany this article were treated with medium-sized self-regulating tubes, energized by a twenty-four plate static machine, capable of giving an eight-inch spark. The tube was kept at medium to medium low vacuum and the glass from two to eight inches from the growth. The first exposures were made every second day for about five minutes, at about six to eight inches.

The time of exposure was increased and the tube placed closer, until a mild dermatitis was produced at the margin of the growth, which was exposed through a hole in a double layer of Grubbe lead foil carried close up to the margin.

Treatment was continued every day or every other day, regulating the vacuum, distance, and time of exposure, so that the growth was kept "soppy," disintegrating, and no uncomfortable dermatitis produced. If too much activity was manifest, I shortened the time of exposure, increased the distance of tube,



Illustrating Roentgenotherapeutic Technique — *Brosius*
The Archives of Physiological Therapy — September, 1905

or treated less frequently as appeared best, sometimes allowing a rest of a week.

Under such a course epitheliomata have melted away in from thirty to sixty days, leaving so little deformity, that one could wonder at the results.

I would insist upon the importance of learning the resistance to the influence of Roentgen radiation, and the disposition to repair in each individual case. For these two processes, the destructive and the constructive in the case in hand will determine the activity of your treatment.

This is important, as some individuals require much harder treatment than do others.

Vacuum, distance, time, and frequency of exposure are the factors on the electric side, while the vitality of patient, location and character of growth are the considerations on the patient side. If these are carefully studied and kept in mind, I believe we in the country, with only a static machine, may do very satisfactory work.

Let us be practical and thorough, hoping for a more definite technique when the masters better understand the complex character of radio-activity.

EDITORIAL

THE SEPTEMBER, 1905, CONVENTIONS OF THE NATIONAL AMERICAN ELECTRO-THERAPEUTIC AND ROENTGEN RAY ORGANIZATIONS

The four months ending with September, 1905, will have been marked by an unusual number of meetings for the study of physiological therapy. First, occurred the Roentgen Congress at Berlin, an event which, as regards the number of participants and the interest manifested, has no parallel in the history of physiological therapy and hardly in the history of any other one department of medicine; second, the French Congress of Climatology and Urban Hygiene; third, the International Congress of Physiotherapy; fourth, the Congress of Radiology and Ionization, both of the last-named being held at Liege, Belgium, under particularly favorable auspices; and lastly the annual meetings of the American Electro-Therapeutic Association and American Roentgen Ray Society.

Such a rapid succession of large and momentous aggregations is unmistakably significant and can lead to but one conclusion, viz., that physiological therapy has at last succeeded in impressing the professional mind with a realization of its importance. That the majority of these events should be concerned principally with electro- and radiodiagnosis and therapy is not surprising when it is recalled that the first-mentioned is much older than the

others, and when the striking, positive, and definite diagnostic and therapeutical capabilities of the latter are considered; the prestige conferred by a long-continued development and familiarity, constitutes a good groundwork upon which to erect the structures of recognition and appreciation, and brilliance constitutes a powerful aid to popularity.

That the newer and less well-known forces are about to feel the effect of the large amount of work which has been done along these lines during the past eight years, however, is demonstrated by the fact that the Congress of Physiotherapy presented sections on mechanotherapy, thermotherapy, aerotherapy, and hydrotherapy; a striking innovation which it is to be hoped will be retained in future functions of this kind. These forces present potentialities of large extent and great value, and their development can be extended along profitable lines only by turning the search-light of public scrutiny and discussion upon the reports of individual investigation. Thus, and thus only, can truth be caused to emerge from the mists of error, uncertainty, and empiricism.

Of most interest to Americans, in this connection, are the annual conventions of the American Electro-Therapeutic Association and the American Roentgen Ray Society, which will be held, respectively, at the New York Academy of Medicine, September 19th, 20th, and 21st, and at Johns Hopkins University, Baltimore, September 28th, 29th, and 30th. The meetings of these bodies are always replete with interest and instruction, and we have no hesitation in urging our readers to attend one or both functions.

The preliminary programme of the first-named body is as follows:

The Importance of Differentiation in the Use of Electric Modalities. Alfonso David Rockwell, New York, N. Y.

Conservative Gynecology; Its Relation to the Continuous Current. Margaret Abigail Cleaves, New York, N. Y.

Choice of Methods in Treatment of Operable Cases of Cancer. George Betton Massey, Philadelphia, Pa.

A Clinical and Experimental Study of the Action of Mercuric Cataphoresis in the Treatment of Cancer; with a Further Report of Cases. Amedee Granger, New Orleans, La.

The Practical Uses of the Sinusoidal Current. Fred Harris Morse, Boston, Mass.

Non-Surgical Treatment of Inflammatory Derangements of the Female Pelvis, Unaccompanied by Pus. Almerin Webster Baer, Chicago, Ill.

The Cosmetic Value of Electricity. Laura Viola Gustin-Mackie, Attleboro, Mass.

The High-Frequency Currents in General Practice. John Troutman, Kansas City, Kan.

The Wide Range of Electricity in Therapeutics. William Benham Snow, New York, N. Y.

Some of the Causes of Failure in Treating Malignant Growths by Electric Currents and X-Rays. Robert Reyburn, Washington, D. C.

The Treatment of Tubercular Glands. George Coffin Johnston, Pittsburg, Pa.

X-Ray Treatment of Epithelioma. John Nesbit Scott, Kansas City, Mo.

The Roentgen Rays and Radium in Therapeutics. Mihran Krikor Kassabian, Philadelphia, Pa.

The Combined Use of X-Rays and Ultra-Violet Rays in Skin Diseases. Francis Goodwin DuBose, Selma, Ala.

Successes and Failures in the X-Ray Treatment of Epithelioma of the Lip. George Henry Stover, Denver, Colo.

Treatment of Tuberculosis. Jefferson Demetrius Gibson, Denver, Colo.

Some Effects of the Incandescent Light. William Sharp Lindsay, Topeka, Kan.

The Electric Light in the Treatment of Syphilis. Henry Finkelpearl, Pittsburg, Pa.

Sciatica. Francis Besant Bishop, Washington, D. C.

Etiology and Elimination of Diabetes. George Lenox Curtis, New York, N. Y.

Gonorrhea; Its Evil After-Effects on Husband, Wife, and Child. Elijah Wilkinson Smith, Terre Haute, Ind.

Inter-Cellular Oxidation. Harvey Hamilton Roberts, Lexington, Ky.

Manual Therapy; an Invaluable Aid to the Electro-Therapeutist. John Thompson Rankin, Los Angeles, Cal.

Mechanical Vibration in the Treatment of Herpes Zoster. William Gray Schauffler, Lakewood, N. J.

Radiant Energy and Ionization; the Physical Basis of Vital processes and Their Derangements. William James Herdman, Ann Arbor, Mich.

The Present Status of the Treatment of Malignant Tumors. William Edgar Deeks, New York, N. Y.

The headquarters of the American Roentgen Ray Society will be at the Belvidere Hotel, and railroad rates of one fare and a third for the round trip have been secured from all sections of the country except New England. It has not been possible to secure the preliminary programme of this Society previous to our going to press, hence we are unable to inform our readers definitely upon this point.

An exhibit of electro- and radio-therapeutical apparatus will constitute an important feature of both conventions.

JOURNAL OF ADVANCED THERAPEUTICS

New York, N. Y., July, 1905

1. Personal Experience in the Employment of Mechanical Vibration in the Treatment of Rectal Diseases — Wm. L. Dickinson.
2. Summary of an Experimental Inquiry on the " Diaphragm Symptom " in Chronic Pulmonary Tuberculosis — C. M. Desvernine.
3. Principles of Psychotherapy — Leslie Meacham.
4. A Three-Fluid Current Controller, Cataphoresis in Surgery — F. C. Marsh.
5. The Physics of High-Frequency Currents, with Special Reference to their Use in Therapeutics (*to be continued*) — Earle L. Ovington.
6. Report of the Committee on Current Classification and Nomenclature (*to be continued*) — W. J. Jenks and Chas. L. Clarke.

1. See page 175, this issue of the ARCHIVES.

2. An interesting account of physiological experiments undertaken with a view to ascertaining whether or not the limitation of the diaphragmatic excursion, so frequently seen in early pulmonary tuberculosis, was due to the influence of the local tuberculosis infection or local pulmonary or pleuritic congestion. The animals experimented upon were dogs and rabbits and the experiments consisted of injecting tuberculine free from bacilli, into the apices of the lungs so as to bring about a local tuberculine intoxication such as would exist when the tubercle bacillus germinates in these regions.

The results of the experiments were observed electrically through stimulation of the innervation, roentgenoscopically, and by autopsy.

It was found that diaphragmatic paralysis *occurred constantly on that side in which the injection was made,* and that pulmonary basal congestion sometimes occurred on the side not injected, *but this latter phenomena did not bring about diaphragmatic paralysis.* Desvernine therefore concludes that the diaphragmatic paralysis is brought about by the tuberculous deposits and that the lung congestion about the diaphragm itself has no marked influence on the activity of this structure.

3. This paper represents that psychotherapy which has no contact with psychopatholgy. It proceeds upon a historical resume from Mesmer through Braid to Bernheim and F. W. H. Meyers; then follow long extracts from these varied writers calculated to exhibit that psychology best adapted by survival to the uses of psychotherapy. Bernheim in particular is quoted at length.

The whole subject matter, therefore, revolves about suggestion, in which the writer seems to follow the Nancy school, ignoring more or less completely, perhaps more or less innocently, that psychopathology represented by Janet, Sollier, Freud, Silis, and many others, upon which a rational psychotherapy is now slowly building.

As embodying the principles of suggestion then, the article has about it nothing sufficiently concrete or original in formulation to call for further notice.

4. Marsh has constructed an apparatus for the control of galvanic currents in which the non-electrolyte alcohol, water, and copper sulphate solutions are utilized as resistants. The apparatus consists of a heavy glass tube three-quarters of an inch inside diameter and 18 inches in length, one end of which is stopped by a rubber cork through which passes a thin brass screw, the inner end of which is connected with a small copper cylinder one inch in length, which rests inside the tube at the bottom, in the copper sulphate solution; the outer head of this screw is fitted with a tube

connecting it with a conducting wire. The tube is placed in an upright position and about six inches of a concentrated solution of copper sulphate poured into it, this solution resting upon the rubber cork. Six inches of ordinary hydrant water is then poured carefully into the tube so that it will not mix with the copper sulphate solution, but will remain on top of it as a distinct layer. Two or three inches of alcohol are then poured into the tube with the same precautions, so as to form the uppermost layer.

The positive electrode of the apparatus is constituted by a pointed strip of sheet copper which dips into the fluid and which in turn is soldered to 20 inches of copper wire No. 14. This is made to pass up and down between two small rubber-covered rollers operated by a wheel of fine adjustment, the other end of the wire being attached to a binding post at which point connection can be made with a conducting cord. The piece of copper is susceptible of being pushed to the bottom of the tube into the copper sulphate solution or raised to the top of the alcohol layer, by turning the screw which controls the rubber rollers, up or down. In this way the resistance represented by the different layers of fluid can be interposed in varying quantity so as to stop the current flow altogether or to allow it to flow in its full strength. It can also be used as a shunt, when the interposition of a small resistance will cause a small quantity of current to flow through the patient or raising the positive copper electrode attached to the wire into the alcohol layer whereby a large resistance is interposed, a large quantity of current can be caused to flow through the patient. This does away entirely with the disagreeable little shocks which result from endeavoring to control a current by means of metal buttons. The results obtainable with this apparatus will equal those obtainable with the graphite rheostat and will be efficient in the control of much heavier currents.

The article closes with a well-deserved tribute to the cataphoric sterilization of cancer and tuberculosis lesions evolved and perfected by Dr. G. B. Massey of Philadelphia, and in the application of which this new current-controller promises to be most useful.

5. This article will be abstracted when it is concluded.

6. See THE ARCHIVES for June, 1905.

ARCHIVES OF THE ROENTGEN RAY

London, England, July, 1905

1. The Electrical Treatment of Ringworm — J. L. Bunch.
2. Protection in X-Ray Work — W. Deane Butcher.
3. Quantimeter for Measuring the Intensity of Roentgen Radiations.
4. Report of the X-Ray Treatment of Lupus at the Royal Victoria Hospital, Belfast — J. C. Rankin.
5. The Use of the Diaphragm in X-Ray Work, with a Note on Orthodiagraphy — Paul C. Franze.
6. On Osseous Formation in Muscles due to Injury (Traumatic Myositis Ossificans — Robert Jones and David Morgan (*continued*).

1. Bunch discusses the treatment of ringworm by radiotherapy. Freund first attempted this method in 1896. The following attempts were largely unsuccessful, and the accidents resulting from over exposure caused the treatment to fall into some disrepute. The large number of exposures necessary, and the inability to measure the dosage and thus foresee the degree of reaction following, added to the danger.

This reaction depends on the quantity of rays absorbed and to a lesser degree upon idiosyncrasy or the degree of the lesion.

The discovery of Holzknecht, of a substance becoming darker when ex-

posed to the X-ray, provided a photometer giving a fairly accurate measurement. Sabouraud, at the Hospital St. Louis, has worked out the dosage in ringworm with great care and excellent results. The method is painless, the time is short, the diseased hair falls out at a definite interval following the application and is replaced by healthy hair. The coil or static machine may be used for the production of the necessary current of high voltage, and a time exposure of 10 minutes is employed. The parallel spark gap of 3.7 inches should be employed and the vacuum of the tube not allowed to rise above such a resistance. The degree of hardness or softness of the tube should equal the fourth division of the scale of the radiometer of Benoist. The tube should be enclosed in an ebonite or lead glass case. The former causes the tube to become hard while the latter does not affect it thus.

The anti-cathode should be exactly 15 centimeters from the surface of the scalp. The quantity of X-ray emitted in a given time must be accurately known. Holzknecht's pastilles form an excellent radiometer except for their expense. They are composed of a mixture of alkaline salts and resin slowly changing in color under exposure to X-rays. A pastille is placed at each exposure in the path of the rays, at a distance equal to that of the patient, and the change in color is compared to the standard scale, consisting of 12 degrees. When the pastille has darkened to a tint matching No. 5 on the scale, a sufficient dose has been administered, at least for that sitting.

Sabouraud uses paper covered with an emulsion of platino-cyanide of barium in a collodion of amyl acetate, which is cheap and can be employed repeatedly. Its color can be restored, but it is less sensitive than the pastilles to X-rays, and must be placed nearer the tube in order to get a correct reading.

If a patch of ringworm be exposed at a distance of 15 centimeters from the anode of a tube till the quantity of X-ray received equals 5 units Holzknecht, the result is a simple depilation without burns. On the seventh day a slight erythema occurs, which disappear in three or four days and is followed by some pigmentation. On the fifteenth day the hair falls out and in a few days depilation is complete. The X-ray does not kill the parasite of ringworm, hence reinfection is easy. The growth of new hair is slow, hence the last of the diseased hair has been extruded before the appearance of the new hair, this last event usually occurring about the tenth week following exposure.

For a single patch a single treatment may suffice, but where a large portion of the scalp is affected the difficulty increases. Direct rays only should be employed, and the tissue shielded from oblique rays. If a large area of the scalp is affected, small portions should be treated at a time. It is more dangerous to work with rays of 10 degrees penetration than those of but 4 degrees, and when a tube giving rays of 10 degrees on the radiometer is employed, the time must be much shorter, lest unpleasant results, burns, or complete, lasting alopecia may result.

In one year Sabouraud obtained 104 cures in his ringworm school, the following year he obtained 327 cures in the same school. Formerly it took eighteen months and cost two thousand francs to cure a case of ringworm at the St. Louis Hospital. Now it takes three months and costs 260 francs. If success is not obtained, the operator is to blame for overlooking small patches of disease, or treatment has been insufficient at one or more points.

During treatment, a 10 per cent. iodine alcohol solution is applied daily to the scalp, after washing with soap and water, and at night 40 per cent. oil of cade ointment.

2. Butcher claims that laboratory workers are exposed not only to the di-

rect action of the X-ray, but also to the effects of ionized air. This is easily proven and the action of ionized air on the organism has not yet been determined. Experiments along this line should be undertaken. One observer has noticed increase in arterial tension and stimulation of urinary secretions on turning the current through a focus-tube, although the observer was at a considerable distance.

Many patients complain of lassitude after exposure. During the action of a Roentgen tube the air ceases to be an insulator, and we must recognize the necessity for thorough ventilation of X-ray laboratories on this account. Where high-frequency is being used and ozone with its iritating action on the air passages is being produced in large quantities, ventilation is even more important. Every person in the X-ray room should wear gloves if they would avoid irreparable mischief to the hands.

The first action of the ray is to affect the vaso-motors. In small doses it is a direct stimulant to the muscular tissue of the blood vessels. In freely repeated doses. these muscles are over-stimulated and destroyed. An ordinary X-ray burn may heal completely but the surface remains cold and dead. The vessels dilate under internal pressure. If the X-ray worker notices his hands getting sunburnt, he should take warning, since the next stage is the loss of hair, splitting of the nails, coarsening of the skin, increased sweating of the palms, and irreparable injury. All this may be avoided by the use of proper gloves. The deleterious action of the ray on the reproductive organs is being guarded against by the Germans and French, by a variety of aprons and armor. An easy way is to enclose the tube in one of the various ray proof shields.

3. Kienbock's quantimeter consists of a strip of silver bromide paper, enclosed in a double envelope, and placed beside the area under treatment. Upon development, provided the same technic be employed each time, and comparison be made with an arbitrary scale of strips of the same paper, an indication will be given of the quantity of ray which has reached the paper. If a definite dose is to be given at a single exposure, a number of strips are placed on the skin at the beginning of the seance. One is removed from time to time and developed, and when the last strip removed shows an exposure equivalent to that desired, treatment is stopped. If the dose is to be divided over several treatments, a strip is exposed each time, developed, and the scale number recorded. When the sum of this exposure equals the dose desired, treatment is stopped. A separate strip is exposed during each of the treatments, and the strip is developed at the end of the series of treatments, whereupon its reading should equal the sums of the readings of the other strips. Each strip must be developed the same length of time, with the same developer, at the same temperature, if uniform results are to be obtained. The finished slips may be preserved as permanent records and proof of the dose given each case.

4. Rankin reports five cases of lupus treated with a soft tube, at a distance of 6 inches, 10 minute exposures, coil and Wehnelt interrupter. Each of the cases showed a marked reaction, which subsided in about a week. Two of the cases showed alopecia, which was not permanent. Two of the cases were cured. One was healed but relapsed six months later. The other two were improved.

In January, 1904, he began another series of cases, giving an exposure of 5 minutes, using a current of 3 amperes, with a tube of medium vacuum, treatment three times a week. These patients have showed but slight reaction and many have made steady improvements. The patient was protected by a lead shield and the operator by a superleaded glass tube shield. Most of the cases

were of several years duration. In 42 the lesion was located on the face. Those cases having large ulcerated surfaces, derived the greatest benefit, while the non-ulcerative type has shown greatest resistance. Four cases have reported several months later, free from disease. Six apparently cured have not reported. In 17 very definite improvement followed. In 13 cases some improvement. Ten cases have been treated more than five months with no improvement. In no case has the disease progressed under treatment, and as yet no untoward results have followed the treatment.

5. When objects are penetrated by X-rays, secondary rays are formed, which render indistinct the outlines of the skiagraph. These rays originate on the walls of the tube, in the air, in objects penetrated on the photographic plate, and in its emulsion. They consist of diffused X-rays, cathode rays, and ultra violet light, the latter being produced by Roentgen rays wherever they strike or penetrate an object. Their amount varies with the nature of the bodies traversed. They are entirely diffuse, they affect photographic plates and the fluorescent screen. Their action increases directly as the penetration of the X-ray, hence they increase the difficulty in radiographing thicker parts of the body. They deteriorate the quality of the radiograph as regards differentiation in density. They may be avoided and stopped off with a measure of success by diaphragms. It is necessary to keep away from the object, all X-rays save those concerned in radiography. Simple plates of lead with circular openings interposed between the tube and the object accomplish this or a so-called iris diaphragm may be employed. In combination with the diaphragm, compression, reducing the depth of tissue and the penetration required enables us to use rays of less penetration which form fewer secondary rays. Fatty tissues are especially prone to form S-rays. Cylindrically shaped metal tubes should not be employed for compression diaphragms, since S-rays are set up by the action of the rays on the walls of the cylinder, but instead of a cylinder a ring should be employed for compression, adjusted to the diaphragm by lateral rods.

Wiesner's diaphragm consists of a wooden stand having a recess for the plate, supporting a steel bar which carries a tube holder and a plain diaphragm. When in use the aperture is made as small as the object will permit of and placed directly on the part to be skiagraphed. In the case of the abdomen or pelvis the compression is applied. He calls attention to the importance of absolute immobility during radiography. Pressure assists in obtaining this. The anti-cathode and the center of the aperture of the diaphragm must be carefully adjusted.

6. Jones and Morgan continue their discussion on "Osseous Formation in Muscle Due to Injury," and give a table of 35 cases collected by Cahier, which does not admit of abstraction.

ARCHIVES D'ELECTRICITE MEDICALE

Bordeaux, France, June 10, 1905

1. The Importance of Dosage and of Method in Radiotherapy — Dr. J. Belot.
2. Hematological Changes observed in Spleno-Medullary Leukemia under Radiotherapy — Dr. Acuna.
3. A Case of Epithelioma of the Face cured by the X-Ray — Dr. G. Audhury.
4. New Instrument. The "Monopol" X-Ray Tube — Dr. Etienne Henrard.
5. French Societe de Physique, Annual Meeting.
6. Roentgen Congress.

1. There are two methods of application of the X-ray in the treatment of neoplasms. In one repeated small doses are given daily or every other day until a

reaction is seen, when the treatment is suspended for a time. In the other method a sufficient dose is applied at a single session or at two or three successive exposures, to produce a curative effect and then the appearance of a reaction awaited. The first method is less and less used; it is empirical and dangerous, it does not employ instruments of measurement, and often does not permit of their employment. Belot hopes it will soon be entirely abandoned.

The second method is based on an accurate measurement of the quantity of X-radiance absorbed. The question as to whether the dose absorbed must always be less than required to produce a superficial dermatitis is answered in this way: radiodermatitis is never necessary to a cure; it is not an adjuvant; the patient does not get well because of the dermatitis; but sometimes the dose required to cure the neoplasm is so large as to surely cause a dermatitis, which is to be regarded as a necessary evil. A great many cases, however, can be cured without the least cutaneous reaction. Thus alopecia of the hairy scalp may be produced without any local inflammation. Certain cases of adenoma, leukemia, and even of epithelioma disappear without cutaneous reaction.

He cites a case in which large doses of X-radiance were required. Woman, aged 47, with chondroma of the parotid, operated upon November, 1901. Recurrence in June, 1902, involving the region of the ear and the cheek up to the level of the eye. The patient could not open her mouth fully. Injections of a special serum were without result. She did not desire another operation and applied to Dr. Beclere for X-ray treatment, which was discouraged owing to the gravity of the case. She was given 31 daily short applications by another radiologist. These were not followed by any local change, and the tumor continued to increase in size. A second radiologist gave treatments of five minutes duration once a week for six weeks without benefit. A third radiologist gave four or five minute treatments three times a week for a month, and finally the patient went to the author March 28, 1904.

The large tumor occupied all the region of the ear and extended from the eye almost to the chin; cachexia had begun and there was very severe pain. Treatment consisted in the application of 9 Holzknecht units at a single session with rays No. 6 or 7 and the neighboring skin protected by sheet lead. Fifteen days later the patient was seen again. The pain was less. General condition improved. Tumor smaller. Skin red. In spite of the condition of the skin 6 or 8 H. were applied and 15 days later, when the patient returned, the tumor was one-quarter smaller than in the beginning. The skin was violet colored, excoriated, and even denuded of epidermis in places. No treatment until another 15 days, then 6 or 7 H. every 15 days, suspending treatment when the reaction became too severe. The patient's general condition rapidly improved, she gained weight, and the tumor became progressively smaller. The greatest benefit was produced by the strongest applications and those which produced the greatest reaction.

After the critical stage was past doses of 4 or 5 H. were continued every two weeks for several months. There is now (May, 1905) only a vestige of the growth which is daily diminishing.

Another case was an epithelioma of the face in a man of 67. He had been treated by daily applications of 10 or 15 minutes duration, the tube 15 cm. from the skin for 15 days; later, three times a week for 27 applications altogether. The tumor had diminished a little, the neighboring hair had fallen out as the radiologist had used no protection. There was no treatment for 4 months, during which time the tumor increased rapidly in size; then 25 treatments at the

rate of three times a week; the tumor increasing instead of diminishing. Belot found a vegetating epithelioma about 3 cm. in diameter and about 3 cm. in height. Administered 10 H. at one seance, rays 7 or 8. Eight days later 7 H. The tumor diminished rapidly in size and is today completely cured. Smaller doses are still being applied.

A third case was a man with a large, offensive, ulcerated epithelioma of the lower lip with extensive induration; administered 10 H. at one application; 7 or 8 H. eight days later. The lesion was decidedly benefited, induration less, ulcer lost its sluggish character, discharge freer, glands diminished. The reaction was not violent. A cure was looked for but the patient contracted bronchopneumonia and died.

He has noted that some mucous membranes stand as high or higher doses than the skin. He does not hesitate to begin the treatment of an ulcerated epithelioma by a single application of 8 or 10 H. followed by an intermission of 15 or 20 days. The result is quickly obtained and there is no disquieting inflammation.

He does not consider it ever right to produce an escarotic effect. The patients he has believed to require large doses have never presented more than a pronounced superficial erosion.

2. Acuna says that there are numerous reported cases in which leukemia has been benefited by the X-ray. The spleen diminishes in size, general nutrition improves, the hematopoietic organs decrease as do the glandular masses. An increase in the number of red cells and a great decrease in the number of white cells have been noted. In Brown's case from 800,000 white cells to 8,000. Aubertin and Beaujard noted that each application is followed by a marked leucocytosis, which diminishes until, after two or three days, there is a smaller number of white cells than before the application.

In one of Acuna's cases the white cells diminished from 860,000 to 480,000 and the myelocytes from 45 per cent. to 30 per cent., while the polynuclear leucocytes increased from 43 per cent. to 60 per cent. The red cells and the amount of hæmoglobin increased, but there was no appreciable change in the size of the spleen.

In the other case the leucocytes diminished from 250,000 to 95,000, the polynuclear leucocytes increased from 45 per cent. to 60 per cent., while the myelocytes decreased from 43 per cent. to 25 per cent. In this case the improvement was only temporary. Two months after treatment was stopped the blood examination showed the original condition. In both cases the X-ray had been applied only to the spleen.

3. The patient, a woman of 70, had for several years a number of epidermic excrescences on the face which did not yield to various salves. A year ago a tumor began to develop on the forehead, first the size of a pea, but increasing to that of a small mandarin orange, ulcerated over its entire surface, hard and adherent. Various treatments were unsuccessful. There were other growths on the face, but none were ulcerated. No glandular involvement. Treatment was begun Dec. 24, 1904. Ten centimeter induction coil, liquid interrupter; Chabaud-Villard tube with cooled anti-cathode; 125 volts, 9 amperes primary. Secondary (Gaiffe's milliamperemeter) 1 ma. Rays No. 6 Benoist. Twelve minutes at a distance of 10 cm. from the anti-cathode. Not quite 4 H. Three other exposures of 10 minutes were given at intervals of five days, between 2 and 3 H. Never any dermatitis.

After the fourth exposure the tumor became movable. Treatment continued at intervals of 15 days. After the seventh treatment the tumor came away without pain, leaving a rosy epidermis (Feb. 3, 1905). Treatment was then applied to the other growths on the face with equal success. In May, 1905, there

was no sign of recurrence.

4. The "Monopol" tube made by Hirschmann of Berlin is especially devised for easy regulation of the vacuum without interruption of the X-ray. Using a spintermeter with ball terminals he finds that each centimeter of spark equivalent practically corresponds with this tube to the same number of the Benoist scale of penetration. It is a bianodal tube with a separate bulb at the cathode end for lowering, and another at the anode end for raising the vacuum, and either of these may be caused to operate by simply pulling its movable arm with an insulated hook. This may be done while the tube is in operation.

5. Lezy exhibits portable bisulphate of mercury batteries for galvanic and faradic currents and new flexible surface electrodes. Heller, an orthodiagraph. Drault an adjustable tube-carrier, shield, and orthodiagraph combined. Ducretet a Ruhmkorff coil, portable and powerful enough for wireless telegraphy or X-rays. Thurneyssen (successor to Chabaud) mercury arc lights with iron electrodes. The Cooper-Hewitt mercury vapor light was exhibited.

6. At the Roentgen Congress Muller exhibited an X-ray tube, the active hemisphere of which is surrounded in great part by substance opaque to the X-ray, which is a non-conductor, and which is said to cause little condensation. At the proper point there is a cylinder of lead glass and still smaller cylinders of the same material can be fitted to this. The whole forms a convenient localizing device and any of the Muller tubes may be so made.

Muller also showed a water-cooled tube which may be placed under the part to be examined; also a double regulator for reducing the vacuum. This adds just so much to the life of the tube.

Heinz Bauer exhibited X-ray tubes in which the rapid raising of the vacuum, due to the pulverization of the platinum anti-cathode, is prevented by causing the current to pass mostly to the anode. To this end the anode is pointed and contains quite a mass of metal; besides this a regular small self-induction coil is placed between the external connection of the anode and that of the anti-cathode. Another of Bauer's tubes has a heavy corrugated copper stem for the anti-cathode, dissipating heat inside the tube and also externally through a reentrant glass tube which forms a part of it.

Max Becker showed a tube with a very heavy anti-cathode and with a regulator which lowers the vacuum more or less rapidly according to the connections which are made.

Burger exhibited various tubes with regulation by spark or by heating with a lamp. Ehrhardt's tube contains a substance which is made red hot by the current and thus generates gas and keeps the vacuum from rising.

Rosenthal's platinum-iron tube (Polyphos Co. of Munich) has an anti-cathode which does not become red hot with the heaviest currents and has an automatic regulator. Setting a spark-gap of a certain length on the regulator keeps the vacuum at that degree. The "Ideal" tube (Electricitats Gezellschaft, Aschaffenburg) has a diaphragm fastened to the anti-cathode in such a way as to permit the passage of only the central rays, and an extreme divergence of only 90 degrees. This has the Villard osmoregulator.

Reiniger's tube may be regulated by a spark or by the osmoregulator. Koch and Sterzel (Dresden) showed tubes with one cathode for direct currents and two cathodes for alternating currents. They have a very heavy anti-cathode and a very sensitive osmoregulator.

Siemens and Halske exhibited a tube "a anti-cathode an tantale." This has a higher fusion point than platinum and is said not to undergo pulverization, consequently the vacuum is more stable.

ARCHIVES D'ELECTRICITE MEDICALE

Bordeaux, France, June 25, 1905

1. Some Points in the Technique of the Radiotherapy of Cancerous Tumors: Accessory Apparatus; Mode of Operation — Dr. H. Guilleminot.
2. Interrupted Currents in Medicine — Dr. Lewis Jones.
3. Correspondence between the Area of the Electrodes and the Electrical Resistance of the Human Body — Dr. Stephen Leduc.
4. A Regulatable Lamp for Heating the Osmo-Regulator from a Distance — Dr. G. Barret.
5. The Roentgen Congress; Review of the Exposition.

1. Guilleminot has his X-ray tube in a heavy box lined with sheet lead and again with an insulating material. The lead is grounded. The back of the box is made of heavy glass permitting the operator to observe the condition of the tube, but affording ample protection. The diaphragm of the box is so large as to emit a cone of rays twice as large as necessary for the treatment of the individual case. The area immediately around the lesion is protected by sheet lead with a hole cut in it and secured by adhesive plaster. By this combination of localizer and sheet lead protection the lead required is only a small and convenient piece and the involuntary movements of the patient, which would render difficult exact application with the localizer alone, produce no disturbing effect.

He has this box on a stand giving universal motion and has binding posts on the box to which the heavy wires pass from the coil. Separate wires pass from the box to the tube and the chance of breakage is diminished. For any of the cavities of the body the same box is used and a speculum is introduced into the cavity; with a small piece of sheet lead about the orifice.

As to the question between frequent short applications and single large doses, he says that the results obtained by the men who use the former are equally good. He quotes Bergonie, Oudin, Costa, Williams, Schiff, Freund, Guilloz, etc., as using fractional doses, while Kienbock, Holzknecht, Brocq, and Beclere use massive doses. He does not know of a case where grave effects have followed small doses repeated every two days, while there are many on record where such followed massive doses. Whether the effect is upon the endothelium of the blood vessels (Baermann and Linser) or upon the epithelial cells (Scholtz, Morton, and Mertens) it is certain that the affected cells have a constant tendency to return to the normal, and his idea of radiotherapy is that the size and frequency of the dose should be such as to produce but slight cumulative effect upon healthy tissues in general, while the greater susceptibility and slower recuperative power of cells of the embryonal type, as in cancer, results in their incomplete recovery from the first dose when the second dose is applied. There is thus a cumulative effect upon these particular cells and a cure without much effect upon the sound tissues.

This is entirely analogous to the destruction of the graafian follicle or of the spermatozoa and the production of sterility by X-radiation without any cutaneous lesion. He uses strictly measural doses, however, and applies a total in 15 days of scarcely what would be dangerous as a single dose.

Two considerations make this safer.

1. Absolute measurement is difficult.
2. There certainly is some idiosyncrasy in different individuals.

This also reduces the danger from the absorption of toxæmic products. Holzknecht's wafers and Labouraud and Noire's platino-cyanide test are excellent, still better is an apparatus in which the fluorescence produced by radium is compared with that produced by the X-ray.

He uses radium of 50,000 activity. Measure the distance at which the two fluorescences are equal. At that distance a body exposed to the X-ray will absorb the unit M of radiance in one minute. (M is a designation chosen arbitrarily.) With his apparatus 500 M equals about 1 H. (Holzknecht unit). To avoid having to calculate the square of the distance, etc., he uses a tape measure with a sextuple scale giving the number of units at six different distances. So that if, for example, the tape has to be pulled out to 3 60/100 meters to make the radium and the X-ray fluorescence equal, the subdivisions on the tape would at once indicate that at 10 centimeters from the anti-cathode one minute's exposure would amount to 1,296 M., at 15 cm. 1 minute's exposure equals 576 M., etc. The time required for 4 H. would be, at 10 cm., 1¾ minute; at 15 cm., 3½ minutes, etc. Of course it is necessary to determine the quality of ray best adapted to produce effects upon the different tissues.

2. The current from a dynamo is found in practice to be too painful for application with small electrodes, although it is all right for electric baths. Why it should be painful is difficult to explain, but it is noteworthy that each wave of current from a dynamo is rarely less than 0.005 of a second in duration. Another form of apparatus for producing intermittent currents is a condenser charged by a constant source and discharging through the human body when a certain potential is reached. But this is not of practical use as the resistance of the body varies so much (from 1,000 to 2,000 ohms) under different conditions. This variation in resistance of course alters the discharge.

The only practicable source of intermittent currents is an induction coil and there are certain important facts to be noted in regard to its construction. The waves of current in the secondary coil are longer the greater the number of turns it contains, and are longer with a soft iron core than without. The effect of the soft iron core is most marked upon the closing wave, but it is also very marked upon the opening wave which is the more important medically. The longest waves are obtained with a great length of wire and a large iron core, and especially if the mechanical interrupter is actuated by an electro-magnet in series with the coil. The application of the current from such a coil is very painful. The shorter the wave of current the less pain is produced.

The best construction is with a short primary and secondary winding without soft iron core and with a mechanical interrupter. The frequency of interruption should be 100 a second with a duration of 1/1000 of a second for each wave and of nine times that length of time for each interruption. A small soft iron core would not materially modify the current from such a coil. Scholl has made such coils for Lewis Jones and many other electrotherapeutists and they have proven very satisfactory. Leduc's mechanical interrupter enables one to use a simple interrupted current or one that is both interrupted and alternating.

3. Leduc says that neither impregnating the skin with a liquid nor the vascularization of the skin produces any important effect upon its electrical resistance. Contraction of the blood vessels by a temperature of 0° C., or dilatation by a temperature of 45° to 50° C., do not modify the resistance of the skin. Finally the intense anæmia from adrenalin introduced by cataphoresis decidedly diminishes the electrical resistance of the skin. The resistance depends upon the nature of the ion introduced, the degree of saturation by this ion, and the voltage employed.

In testing the resistance of the body the size of the contact is regulated by fastening upon the forearm a piece of oil-cloth with a hole cut in it of the proper size for the particular experi-

ment. A piece of absorbent cotton wet with a one per cent. solution of sodium chloride is placed upon the skin and on top of this is a metal plate which forms the terminal of one of the conducting cords. The size of orifice in the oil silk limits exactly the contact of the skin with the solution forming the electrode. The current is turned on until the voltmeter shows a constant potential of 6 volts. This takes some minutes, as, before the skin becomes saturated with ions, its resistance is variable. The amount of current is read off on the milliamperemeter. He gives a table showing intensities varying from 2.05 milliamperes for 2 square centimeters, up to 4.95 ma. for 40 square centimeters. From such experiments he proves that the milliampereage varies inversely with the periphery of the electrode no matter what its shape, and is not proportional to the area of the electrode.

He figures the result of an experiment in which a piece of filter-paper saturated with a solution of sodium sulphate is placed upon a glass plate; upon this paper there are placed two lead disk electrodes and a weak current is passed from one electrode to the other through the fluid which saturates the paper. Lead ions penetrate the solution at the positive pole and produce a black discoloration which shows itself as a ring surrounding the electrode. The paper immediately under the lead disk is not blackened unless the current flows for a long time. In regard to the resistance of the human body, the least pimple or abrasion alters the resistance of the skin very greatly.

4. This is a gas jet of the kind which can be turned down very low, leaving a tiny blue flame burning all the time; a large brilliant flame is produced when the gas is turned on full. The gas jet is mounted on the tube-stand so as to be constantly in the proper position and the change from high to low is made by turning a crank at a distance so that the regulator can be heated without interrupting a fluoroscopic examination if necessary.

5. No static machines were exhibited for X-ray work.

X-ray coils were usually worked by a liquid interrupter, either Wehnelt or Simon-Caldwell. The mercury jet or mercury dip interrupter is very much more troublesome. There was exhibited a new interrupter by Max Levy, in which he uses mercury to complete the contact between surfaces revolving near each other. The primary winding has a variable resistance and self-induction.

Two types of apparatus are used to suppress the inverse discharge. One is Villard's ventril tube; the other depends on the introduction of a spark-gap from a point to a plane surface, or from a point to the interior of a cylinder (Max Levy). The spark-gap has the disadvantage of seriously impeding the direct discharge as well as suppressing the inverse. Generators without an interrupter were also shown.

Grisson's resonator is essentially a condenser of 100 micro-farads capacity, charged from the direct 110 volts electric light circuit; by the rotation of a handle the current may be made suitable for cautery, magneto-therapy, high-frequency, X-ray work, etc. Then, of course, there are the transformers which work without an interrupter, but require a ventril tube.

ARCHIVES D'ELECTRICITE MEDICALE

Bordeaux, France, July 10, 1905

1. Technique of Roentgen Ray Treatment of Tinea — Dr. E. Castex.
2. Action of the X-Ray on the Development of the Embryo of the Chicken — Drs. H. Bordier and J. Galinard.
3. The X-Ray as a Specific in Lymphatadies and Leucemias — Dr. A. Beclere.
4. Two Cases of Leucemia, one spleno-myeloid, the other spleno-lymphatic — Dr. Beaujard.
5. A Radiometer Carrier — Dr. G. Haret.

1. This article is more especially addressed to those in charge of clinics like his own at Rennes, where only a moderate expenditure is possible. He uses a 55 centimeter Ruhmkorff coil with a condenser, a spintermeter, and a Contremoulins-Gaiffe interrupter. The current is modified from the trolley line (continuous current of 500 volts) which runs a 3½ kilowatts motor generator. This gives a somewhat variable current, which is used directly for phototherapy, of 15 to 25 amperes. From this are directly charged a series of storage batteries giving 40 ampere-hours. A simple metal stem with a heavy base and the ordinary chemical tube holder, form the X-ray tube stand and it has a little rod to hold the Labouraud and Noire radiometer at a distance of 8 cm. from the anti-cathode. The operating table is a simple wooden one. His diaphragm-shield serves also as a head-rest, and it is best to ground it.

He marks out all the areas of ringworm with tincture of iodine or fuchsin and clips the hair. Sometimes all the areas can be treated at once through a single opening in the diaphragm with or without strips of lead to protect intervening sound areas. At other times it is necessary to divide the region into rectilinear areas. The anti-cathode should be at a distance twice as great as the largest diameter of the area treated. The sheet lead is disinfected afterward by passing it through a flame.

At first he did not have a radiometer and began with a 20-minute exposure at a distance of 10 or 12 cm. with No. 5 rays (Benoist), 1.5 amperes primary current, 60 volts, 1,500 interruptions a minute. Quite an active dermatitis was induced with successful effect (depilation, return of healthy hair and cure in three months), but he then decided to reduce the exposure to 10 or 12 minutes. When he had procured Labouraud and Noire's radiometer he found that his tube gave the tint B. in 20 minutes. He gives a table of the time required at different distances from the anti-cathode, which saves the trouble of calculating the square of the distance every time. He regards the operator as safe if he simply stands behind the plane of the anti-cathode.

2. Bordier and Galimard allude to the embryological investigations already made. Perthes, experimenting on the eggs of ascaris megalocephala, showed that cellular division was retarded and that abnormal subjects developed. Janur applied radium to hen's eggs and produced monstrosities. Gilman and Bactjer (Johns Hopkins) exposed hen's eggs 10 minutes a day, but did not measure the quantity of radiance; development was accelerated, then retarded and finally abnormal. At the end of four days they observed deformities of the occipital region with hemorrhagic areas extending along the dorsal line. The membranes were often entirely adherent to the embryo. The latter's limbs were generally distorted; when feathers developed they were distributed irregularly over the body in patches.

Their own experiments were made on eggs in an incubator at 40° C. for 21 days. Twelve eggs were taken on April 25, 1905, six of these were for control, the other six being exposed to the X-ray. The rays were No. 7 Benoist. The quantity was 15 H. at each session, time required, half an hour. A thermometer showed that the temperature during exposure was 22° C., the air being 17° C. at first exposure, this being the day before the eggs were first placed in the incubator. Whenever the eggs were handled they were all twelve subjected to the same conditions except as to exposure to the X-ray.

Fourteen exposures were made in 18 days. After 20 days' incubation one of the control eggs was opened and found to contain a little chicken at term. From an egg that had been X-rayed the white and the yolk ran out separately. This was the case with all the eggs. The X-

ray prevented any trace of embryonic development. The white was more liquid and the yolk more granular than normal. There was no decomposition or odor.

An egg which had been X-rayed for only 6 days showed no trace of development. An egg which had been in the incubator for 6 days at 40° C., was rayed for the remaining two weeks and then was found to contain an embryo corresponding to the sixth day. Another control egg was X-rayed only once (half hour, 15 H.) on the eighth day, and it was found at the end of the 20 days' incubation that the embryo had been arrested at about the eighth day.

To test the quantity of X-ray absorbed by an egg the authors placed a Holzknecht wafer under the egg and after 15 H. it was found that the wafer indicated 3 H. Twelve H. had evidently been absorbed by the egg. "Quite a large amount as one sees and which shows that the shell in spite of its contained phosphates is very permeable to the X-rays" (a curious conclusion, the whole egg arrests 12 H. which is a large amount; therefore the shell arrests very little of the X-ray.—Ed.) The albumen was difficult to coagulate by heat, was less viscid than in normal eggs, and was not completely digested in 16 hours by an artificial gastric juice.

3. The X-ray produces a physical effect upon all living creatures; animals, plants, and bacteria. On mammals it is not limited to the skin, but extends to internal organs especially the fundus of the eye, the reproductive glands, testes, and ovaries, and the hematopoietic organs. The last fact has been shown especially by Heinecke. Animals killed by exposure to the X-ray (general dermatitis) show an extraordinarily small dark-colored spleen with microscopically an excessive augmentation of pigment, disappearance of Malpighian corpuscles, and rarefaction of the cellular elements of the splenic pulp. These cellular changes commence within a few hours, attain a maximum at the eighth or twelfth hour, and are complete after 24 hours. They consist in the death of the lymphocytes of the follicles and in the division of their nuclei, the debris of which becomes the prey of phagocytes, and disappears very quickly.

This process of destruction takes place in all the groups of lymphatic glands in the body, in the intestinal follicles and in the thymus of young animals. It does not occur in the marrow of the bones or in the splenic pulp until after a latent period of some days.

The same result is obtainable with a moderate-sized dog by an exposure of 15 minutes at a short distance, and the changes in the spleen and different glands are not accompanied by dermatitis or impairment of the general health. The lymphocytes, though in the deeply situated organs of the body, are more susceptible than the skin and have a much shorter period of latency. The cellular elements of the bone marrow and the splenic pulp are of intermediate susceptibility.

Dr. Senn's case of leucæmia benefited by the X-ray was the first recorded observation. Since then a hundred or more cases have been treated. A favorable effect is produced upon the blood, the spleen, adenopathies, functional troubles and the general health. The number of white cells is diminished and becomes normal. In one of his cases (lymphatic) the white cells changed in seven months from 235,000 to 5,400; in the other case (myeloid) from 349,000 to 4,200 in eight months.

In the myelogenous cases there is a primary leucocytosis after an X-ray treatment and a secondary reduction in the number of leucocytes. In the lymphatic cases the reduction is uniform and not preceded by augmentation. The quality of the leucocytes is also improved, the polynuclear cells gradually become more numerous than the pathological forms.

The number of red cells increased in the first case from 2,600,000 to 3,936,000, and in the second from 2,130,000 to 4,380,000. The amount of hæmoglobin and the specific gravity of the red cells also increased. In both cases the spleen filled the entire left half of the abdomen before treatment and now the spleen is of normal size. All the hypertrophied glands were similarly benefited. Even mediastinal glands are reduced and the dyspnœa relieved. Albuminuria, present in both cases, disappeared. All the constitutional symptoms were relieved.

In cases of leucæmia without an increased number of white cells, but only the presence in the blood of pathologic forms of leucocytes, and in pseudo-leucæmia, the same good results are obtained as in true leucæmia. But this is not the case in spleno-megaly with myeloid degeneration, or from venous congestion, or interstitial fibroma; or in the adenopathies of syphilus or tuberculosis, although the latter are happily modified.

The effect of the X-ray upon leucæmic conditions is so prompt and specific that it may almost be used as a diagnostic test. But as marvelous as are the results in almost all cases, it is true that in many cases the relief is only temporary and that the patient eventually dies of the disease. The two cases at present reported seem to be permanently cured, but time only will tell. The X-ray in leucæmia is comparable to digitalis in heart disease or thyroid extract in myxœdema.

4. This is the detailed report of the two cases referred to in the preceding article:

Case 1.—Spleno-myelogenous leucæmia. Man, 26 years old. First symptom enlargement of the spleen in Feb., 1903. Weakness, dyspnœa, œdema of the limbs developed and he gave up work in April, 1904, vomiting and albuminuria presenting. Rest and internal medication produced little benefit and hypodermics of cacodylate of soda caused no diminution in the size of the spleen.

He came into Beclere's service for X-ray treatment November, 1904. The vertical measurement of the spleen was 38 centimeters and the horizontal measurement 38 cm. The circumference of the body at the level of the umbilicus was 99 cm. Temperature subnormal; 2,700,00 red cells and 236,000 white cells, of which 25 per cent were myelocytes.

Treatment.—The splenic area was divided into sections by sheets of lead and X-rayed every eight days. "The dose varied from 8 to 16 hours" (this must be a misprint for 8 to 16 H.—Ed.) rays No. 8 or 10. After the first couple of weeks the bones were irradiated also. The cutaneous reaction nexer exceeded erythema, active enough, however, to be followed by marked pigmentation.

From the fourth treatment the patient felt better. After a month the spleen began to diminish in size. A complete table shows the change in the blood to normal. In six months the patient received 300 H. units, of which 228 H. were over the spleen.

Case 2.—Man, 42 years old. In 1901, at the 18th day of a sore throat which he attributed to catching cold, he developed glandular swellings in the axillæ and groins and a swelling of the spleen. Treated by Fowler's solution these disappeared. At one stage of the disease there was severe diarrhœa. The glandular swellings gradually developed and were widely distributed. Spleen filled whole left side of abdomen. Injections of sodium cacodylate were made without benefit.

X-ray treatment begun October 3, 1904. Spleen extended from umbilicus to Poupart's ligament. Glandular masses the size of an apple on both sides of the neck. Others in the axillæ, and pectoral regions, the epitrochlear region and in the groins. Blood examination, oxyhæmoglobin, 5 per cent.; red cells,

1,969,000; white cells, 286,900; lymphocytes, 91; mononuclear cells, 7; polynuclear, 2. There was albuminuria.

The treatments were given once a week. Felt well after the first treatment but after the second and some of the other treatments had a dragging pain in the spleen which lasted for a few hours. X-ray applied to spleen and glandular masses. The complete record of the applications, the blood examinations, and the changes in the size of the spleen is given. At the first few applications 4 H. were given over the spleen alone, and by October 24, the white cells had been reduced to 171,600. After that from 12 H. to 20 H. were applied at each session, partly over the spleen and partly over the glandular masses. From October 3, 1904, to June 9, 1905, a total of 294 H. were applied. The final blood examination showed red cells 4,380,000; white cells, 4,200; hæmoglobin, 90 (Tulq.); lymphocytes, 18 (+5 of Turck); large mononuclear, 1.5; mononuclear, 14; polynuclear, 58; eosinophiles, 5. The size of the spleen, originally 31 × 21, had diminished to 15 × 12 cm. Albuminuria has disappeared and the patient has been at work for the last five weeks.

5. Haret's apparatus clamps the stem of the X-ray tube itself and has a graduated rod along which the little film-carrier passes. The test-paper is usually placed at a distance of 8 cm. from the anti-cathode and the whole apparatus is rather close to the stem of the tube and does not obstruct the rays ordinarily directed toward the patient. It is made by Drault of Paris and is especially for the Labouraud and Noire radiometer, the findings of which depend on the change of color taking place in a piece of paper coated with barium platino-cyanide. The original tint is A. When the paper has changed to tint B (a water color standard is provided) the largest proper amount of X-ray has been applied. Anything in excess of this will produce a severe dermatitis, with permanent loss of hair. The test-paper is at a distance of 8 cm. and the skin at a distance of 15 cm. from the anti-cathode. He does not state the relation between this and the Holzknecht unit.

BULLETIN OFFICIEL DE LA SOCIETE FRANCAISE D'ELECTROTHERAPIE ET DE RADIOLOGIE

Paris, France, May, 1905

1. Malignant Tumor of the Breast cured by Treatment with the X-Ray — Dr. Billinkin.
2. After-Result of a Case of Recurrent Epithelioma of the Orbit cured by the X-Ray — Delherm.

1. Billinkin's patient was a lady of 52, with a bad family history, a sister and an aunt having died of cancer of the stomach. In the month of July, 1904, she discovered a small nodule in the left breast, which in three weeks became as large as a hen's egg. She was placed on anti-syphilitic treatment for 15 days with a negative result. She was seen at this time and several times later by a number of physicians who made a diagnosis of cancer, chiefly because of its rapid development, and recommended an operation. This the patient positively refused.

At the commencement of X-ray treatment in September, 1904, there was a tumor the size of a hen's egg in the external part of the breast, hard, nodular, painful on pressure, not adherent to the skin, accompanied by a glandular mass in the axillæ. Three treatments a week were given, for 15 days, three to five minutes at 10 cm. from the tube, rays No. 6 Benoist. Treatment suspended then on account of radiodermatitis. Patient seen again in October; dermatitis almost disappeared, breast and arm painful, and a second nodule the size of a pigeon's egg had formed at the inner

part of the breast. The breast was large and very painful.

X-ray treatment recommenced October 20, three treatments a week of five minutes each, the arm raised and the hand resting upon the head. Treatment continued for five months. The little nodule disappeared in a month and the tumor began to disappear after the fifteenth treatment. At present the breast is normal, but slightly nodular. The arm is still painful and galvanism is being used for a paralysis of the deltoid. No X-rays since March, but he intends to make a dozen more applications.

He attributes the success of the X-ray in this case to the fact that there was little adipose tissue and the tumor superficially located. There was a remarkable degree of tolerance developed in this case. Oudin, in discussing the case, said that it was a pity that there had been no pathological examination as he had seen a somewhat similar case recover under simple compression, that case being evidently one of fibroma. Oudin had noticed an acquired tolerance of the X-ray in several cases.

2. Delherm's patient was a man with an epithelioma at the outer end of the eyebrow, which was first noticed in December, 1903, when it was excised. It recurred a few weeks later and increased rapidly in size and was again excised in April, 1904. A second recurrence took place and on the 13th day of May, 1904, there was present a hemispherical papillary epithelioma about a centimeter in diameter. This was in the left temporal region and infiltrated the external canthus. There was no glandular involvement.

The tumor was completely destroyed by the galvano-cautery. Fifteen days later it was noticed that the ulcer had begun to spread. In spite of a series of deep cauterizations the ulcerated surface continued to enlarge.

X-ray treatment was begun in August, 1904. Three treatments a week, 10 cm. from tube, spark equivalent 3 to 5 cm. The first 15 treatments lasted 6 or 8 minutes each, the last six were at longer intervals and were of 15 minutes each. No change was perceptible until after the first 6 or 7 treatments, but from that moment improvement was rapid. On October 6, 1904, the ulceration was completely healed. In the course of that month the center of the cicatrix ulcerated anew, but healed rapidly under new applications of the X-ray. December 1 and 27, two prophylactic seances of 15 minutes each. Patient seen May 1, that is, 7 months after the end of the regular course of treatment, exhibited a white, smooth, perfectly soft and movable cicatrix; no sign of recurrence.

JOURNAL DE PHYSIOTHERAPIE

Paris, France, June 15, 1905

1. On the Employment of the X-Rays — Dr. Debove.
2. The Electrotherapy of Facial Paralysis — Dr. E. Albert-Weil.
3. Muco-Membranous Entero-Colitis — Dr. Salignat.
4. Annual Exposition of the Societe de Physique.
5. The Roentgen Congress.
6. Second French Congress of Climatology and Urban Hygiene.

1. At a meeting of the Academie de Medicine, Paris, May 23, 1905, on motion of Dr. Debove, a committee was appointed to consider the propriety of conferring with the legislature with a view to limiting the use of the X-ray in diagnosis and therapy to those holding a medical degree.

2. By a systematic electrical examination made at the end of the first week one can determine the length of treatment that will be required and the probable completeness of recovery. For instance, if the muscles and nerves show good galvanic and faradic excitability

and if the reaction formula is normal, *i. e.*, CaCC > AnCC, recovery may be expected in three weeks or a month. But if there is considerably diminished galvanic and faradic excitability of the nerve, the muscles show an increased galvanic excitability, if the formula is reversed and the contractions are slowly produced, the case is more serious and recovery will take eight or ten weeks. Finally, if there is complete degeneration and total loss of electrical excitability of the nerve the prognosis is very unfavorable. It will be two or three months before there is any sign of return of motion and several months may elapse before recovery is almost complete. Generally such a case leaves permanent traces.

In the treatment there are two indications, one directed to the lesion itself and the other to prevent the atrophy and disappearance of the paralyzed muscles. The application to the lesion is made by two sponge-electrodes about 2 centimeters in diameter, one placed in each auriculo-mastoidian fossa and a galvanic current of 6 to 8 milliamperes allowed to flow for about 5 minutes. The negative electrode is on the paralyzed side.

For the muscles, if they have faradic excitability, he uses galvanic and faradic currents separately. The positive galvanic electrode is held in the patient's hand with a current of 5 or 6 milliamperes. The negative electrode is placed successively upon the motor points of the three branches of the facial nerve and the motor points of the muscles supplied by them. The electrode remains in each place about a minute, the current being turned down to zero before changing to another spot in order to avoid disagreeable shocks. The faradic application is from a secondary coil with coarse wire and slow interruptions and strong enough to cause contractions. Each muscle is faradized for about 30 seconds.

When there is no faradic excitability this part of the treatment is omitted and galvanism used alone. Daily seances at first; later three times a week.

Albert-Weil cites the case of a man of 60, who had been treated without effect by vibratory massage, faradism, and effluviation (of high-frequency currents). The trouble increased for nine months and then the correct technique was adopted and in four months there was marked improvement.

3. This first section of Salignat's paper discusses exhaustively the causation and symptomatology of muco-membranous colitis. The second part of the paper is to give the special indications for the treatment of this disease by a course of treatment at the Vichy springs.

FORTSCHRITTE AUF DEM GEBIETE DER ROENTGENSTRAHLEN (Roentgen Number)

Berlin, Germany, April 30, 1905

1. Concerning the Law of Absorption of the Roentgen Rays, and its Explanation — B. Walter.
2. The Technique of Roentgen-Ray Therapy — H. Rieder.
3. Concerning a Practical Method of Measuring the Diagraphic Power of the Roentgen Rays — W. Cowl.
4. Concerning the Metacarpal Fissure, a Type of Lesion of the Middle Hand not Previously Described — Carl Beck.
5. Has Roentgen Therapy Accomplished what it Promised? — R. Hahn.
6. What does Radiological Investigation teach us concerning Croupous Pneumonia — Dr. de la Camp.
7. The Importance of the Roentgen Rays in Orthopedics — Dr. Immelmann.
8. Roentgen Investigations in Internal Medicine — Max Levy-Dorn.
9. A Radiological Operation Table to be attached to a Surgical Operation Table — G. Holzknecht.
10. The Technique of Fixation of the Object in Radiologic Examinations; The Slit-bandages — I. Robinson.
11. Technique of the Albers-Schoenberg Compression Diaphragm — R. Grashey.

12. The Opening in March, 1905, of the New Roentgen Institute of the General Hospital of St. George, Hamburg — Dr. Albers-Schoenberg.
13. The Roentgen Therapy of Carcinoma — A. Koehler and G. Herxheimer.
14. The Treatment of Leukæmia by the Roentgen Rays — Aug. Hoffmann.
15. The Roentgen Treatment of Leukæmia and Pseudoleukæmia — Paul Krause.

1. Roentgen in his third communication stated that after a certain ray was passed through a definite layer of aluminum, glass, or staniol a second layer of the same substance offered less obstruction than the first, — it became harder. He also showed that the rays coming from a certain tube were made up of a variety of soft and hard rays, and that after passing through a certain substance there was a greater percentage of hard rays.

Walter carried these investigations farther and finds that after the rays pass through silver, palladium, cadmium, zinc, and antimony, they are soft instead of hard. In other words these metals absorb the hard rays, while aluminum, copper, and the metals at the extremes of the scale of atomic weights absorb the soft rays. The second layer of any specified substance absorbs less rays than the first. This principle, he believes, can be applied practically in interposing a substance similar to the skin in the treatment of deep-seated growths and thus save the skin.

2. Rieder considers the parallel spark a good means of estimating the quality of rays, though the actinometer of Benoist is more certain. He uses the 110 volt circuit with 10 to 12 amperes passing through an electrolytic interrupter. He uses a hard tube for deep work, and a soft tube for the superficial work. (Hard tube, above 15 cm., medium soft 6 to 15 cm., and a soft tube below 6 cm.) He gives as a focus distance from 20 to 30 cm. The time of the sittings is placed at from 7 to 8 minutes with 10 to 12 amperes passing through the primary, with electrolytic interrupter, or 2 amperes with mercury break. He treats his cases in series. That is, he exposes them daily for three or four days, then allows them to wait about two weeks. If reaction still remains he waits until it disappears. He advises the head, beard, and eyebrows to be covered with lead foil and the eyes of both the operator and the patient to be covered with lead glass spectacles.

3. Cowl uses an instrument which he calls the "Spintermeter" by which he estimates the parallel spark-gap.

4. Beck describes a fracture of the upper portion of the epiphysis of the metacarpal bone which he believes has not been previously described. He believes that many cases of so-called contusions are really fractures or dislocations.

5. Hahn bases his conclusions upon a review of 2,608 cases. Of these 100 were his own and the others were collected from the records of 19 of the best men in Europe. The authors are not all of the same opinion as to the relative value of soft and hard tubes, but as a whole they agree that soft tubes should be used when the skin is to be affected, while the hard tubes should be used when the deeper tissues are to be treated, as in leukæmia. Some authors give one long treatment, while others give several short ones, while still others give one long and hard treatment to be followed by several light ones. The duration of the treatments varied from 5 to 40 minutes, but as a rule 10 minutes were given. The intervals between treatments varied from daily to six weeks, most men, however treated until a reaction occurred, and then discontinued.

The size of the coil, the kind of tube, or the kind of interrupter makes little or no difference in the therapeutic results. Kohler is of the opinion that the Wehnelt interrupter consumes more tubes than the others.

Three hundred and twenty-nine cases of eczema were treated generally with good results. Localized psoriasis has been a success. Ninety cases of acne were treated generally with success. The same is said of acne rosacea. Sycosis, ichthyosis, and warts were treated with success. The ulcerative form of lupus is found to give more satisfactory results than the serpiginous variety. Each case should be handled individually and in general the X-ray should not be depended upon as the only form of treatment. Hypertrichosis has been treated with success, but usually with more or less damage of the skin, while the results obtained in nævi are not worth mentioning. Schiff is quoted with 95 per cent. of cures in 50 cases of rodent ulcer. The later observations upon alopecia areata are less encouraging than the earlier reports. Serious results, which are occasionally detailed in the newspapers, have not been observed by these investigators. The author predicts that the next decade of Roentgen-therapy will show more friends than the past, as our technique and our selection of cases improve.

6. Camp has studied pneumonia, and reports 12 cases. He finds that the shadow in the lobar pneumonia is not a uniform one, but varies in density. He has demonstrated remaining shadows long after the physical signs and the general symptoms had disappeared. In one case the patient complained of pain in the region of the heart upon deep inspiration. Four months after the crisis he finds a fibrous band or adhesion between the left side of the diaphragm and the pericardial sac.

In general the X-ray will show any lesion that can be demonstrated by percussion and in cases of central pneumonia it shows definitely lesions that cannot be demonstrated by physical signs.

7. Immelmann gives an excellent review of the advantages and benefits conferred by the Roentgen ray in orthopedics.

8. Levy-Dorn claims that it is difficult to decide which has the greater advantage in internal medicine, the fluorescent screen or the photographic plate. The plate gives finer detail, but the screen examination is cheaper, more quickly made, and by it we can examine movable organs and can examine them from different directions. He estimates the size of the organs, such as the heart, by changing the distance of the tube from the patient and noting the difference in the size of the shadows. Orthodiagraphy is claimed as a great advance in technique and exactness in the examination of the organs of the chest.

9. The essential feature of Holzknecht's table is the fact that it can be attached to an ordinary operating table, thus permitting the patient to rest partially upon the operating table and partly upon the radiographic table. The top of this table consists of either lead glass or metal. In the center is found an opening which is controlled by an iris diaphragm. The control of the current, etc., is in the hands of an assistant, but the tube is raised and lowered, and the diaphragm is opened and closed by means of 4 pedals under the control of the operator.

10. Robinsohn controls the movements of the object under examination by means of slit bandages. These consist of the ordinary bandage with a transverse slit cut near the center. The bandage is thrown around the limb, or other part of the body. Then one end is drawn through the slit, both ends thrown over the edge of the table, and weights attached to each end.

11. This article consists of a description of the construction and technique of the use of the compression diaphragm.

12. Probably the most important feature in this institute is the provision that has been made for the protection of the physician and nurses. This consists of

a closet which is large enough for three persons, lined with lead. The roof is used for the support of the coil. The switch board is arranged inside, the sides contain a window of lead glass through which the operator can watch his tubes. The closet is darkened so that the operator can make fluoroscopic examinations without leaving the closet. A radiographic table is arranged on each side so that the physician need not leave the closet or wait until one patient is removed before he can go on to the next.

13. This report is based upon the study of a recurrent carcinoma of the breast and extensive metatasis upon the skin and within the lungs, as determined by radiograph. The case was treated 18 times, with an intense light, at a distance of 5 cm., at intervals of 3 to 4 days. Only a section of the tumor was treated at a time, and each portion was only treated two or three times. In eleven weeks, the tumor had practically disappeared, and the area covered over with skin or scar tissue. Metastasis had occurred in the left illiac region, from which the patient died. Microscopical study showed carcinoma cells still remaining beneath the skin, in nests. The author therefore concludes that the rays did not affect the cells deeper than 3 mm. He then makes the broad and startling statement that in all the radiotherapeutic literature no undoubted case has shown a local effect deeper than 6 to 8 millimeters. (The authors have either not read American literature or have discredited it.) They conclude that the changes shown in leukæmia are brought about by changes in the circulating blood in the superficial capillaries. He concludes therefore that only superficial growths can be expected to improve.

14. Hoffmann reports five cases. The first three died of complications shortly after beginning treatment, and therefore are of little value in drawing conclusions. The fourth case, however, is of the greatest importance. There is no doubt of the diagnosis. The blood showed 109,000 white and 3,810,000 red corpuscles; hæmoglobin, 84 per cent. Of the whites, 25 per cent. were myelocytes. After 14 weeks the patient had entirely recovered. This is the only case in which the blood became absolutely normal, that has so far been reported. The author believes that this was due to the fact that the case was obtained early. The sternum was rayed in addition the first seven times, otherwise only the spleen was treated. A hard tube was used at a distance of 25 cm., with 50 volts and 5 amperes. The number of treatments and the intervals between treatments were not given.

15. Krause reports six cases of myelogenous leukæmia, and two cases of lymphatic leukæmia. His general technique consisted of exposures over the spleen, the long bones, and the sternum, and in the lymphatic variety over the enlarged glands. He used a high vacuum tube at a distance of 35 to 40 cm., with 6 to 8 amperes going through the primary. The exposures were made in series, with intervals of about two weeks, and objective improvement was noted in from one to four months. Five of the cases of myelogenous leukæmia, and one of the lymphatic variety were practically but not entirely cured.

The blood showed the most marked improvement, which consisted in a marked reduction in the number of white corpuscles, an increase in the erythrocytes, and an increase in the percentage of hæmoglobin. In the myelogenous variety the myelocytes showed the most marked reduction, while in the lymphatic variety the lymphocytes showed the most change. In one case the red corpuscles were increased to over 6,000,000. The other points of improvement consisted in the reduction in the size of the spleen and enlarged lymphatic glands, the increase in weight, and the subjective improvement consisting of complete relief of all of the symptoms.

FORTSCHRITTE AUF DEM GEBIETE DER ROENTGENSTRAHLEN

Berlin, Germany, June 15, 1905

1. Uniform Nomenclature for Roentgenology.
2. The Free Articulating "Os Vesalianum Tarsi Duplex" in the Roentgenograph — Dr. Gelinsky.
3. Contribution to the Knowledge of Osteitis Deformans — Dr. Wilhelm Sonnenberg.
4. Secondary Developmental Deformities after Chronic Rheumatisn of the Joints in Childhood — Dr. Rudolf Neurath.
5. The "System" of Dessauer — W. Berger.
6. Several Investigations with a Dessauer Inductor — Dr. B. Walter.
7. The Consumption of Tubes by the Use of Small and Large Inductors — Dr. Albers-Schœnberg.

1. The Roentgen Congress in Berlin on May 2, 1905, adopted a uniform nomenclature for the use of the congress and for expression in writing. The following terms shall be used in the future:

Roentgenology, Roentgenoscopy, Roentgenography, Roentgenogram (Roentgen negative, Roentgen positive, Roentgen diapositive), Ortho-Roentgenography, Roentgentherapy, Roentgenizing.

2. Andreas Vesallius first described this bone in 1568. It is a bone lying in the angle between the cuboid and the fifth metatarsal, and articulates with both bones. Seldom it occurs as an epiphysis. At times it becomes united to the fifth metatarsal to form the tuberosity. The author reviews the literature and believes that the case which he reports is the third on record, in which this bone forms an independent articulation. This bone was found in each foot. The patient came to the hospital complaining of pain in the foot, which led to the Roentgen examination.

3. During the past two years three cases of this disease came under the author's observation, which were studied with the Roentgen rays. The disease is also known as Paget's disease of the bones. It consists of a softening and thickening of the bones, which lead to much deformity. So far 60 cases have been studied.

The Roentgen rays show that not only is there a thickening and bending of the bone, but that also a lengthening of the bone takes place.

In the first case the left tibia shows more or less transparent areas, which indicate a decrease in the quantity of lime salts at these points. In the second case the Roentgen rays show, in addition to the marked bending of the femurs, a decided change in the bone at its lower portion. The spongy portion seems to have been inflated. The author presents the first Roentgenogram of the pelvis. The left side of the pelvis is bent inward, and the sacrum seems to be bent forward in its upper portion. In the third case, there had been an operation upon the tibia and a fracture of the fibula. Neither one showed any tendency to heal. This may serve to hold operations in reserve in osteitis deformans.

4. The case upon which this study is based was a child five and a half years old, who had an arthritis which developed insiduously, and began about a year before coming under observation. It began in the feet and ankles, then spread to the knees, spine, elbows, and hands. The joints became swollen and stiff. The knees contained fluid. There was some atrophy of the muscles, and a fine fibrillary twitching. The process was associated with considerable pain both in quiet and by passive or active motion.

A Roentgenogram made shortly after the first visit showed a bowing of the shaft of the radius, the bones in general were more transparent, the shadows of the soft tissues showed a distinct swelling about the joints, the tibia and fibula were stunted in growth. The centers of ossification were, on the other hand, farther advanced than normal, comparing

with the degree found in a child of seven years.

5. Berger compares a Dessauer inductor with an inductor of Reiniger, Gebbert, and Schall and finds that by using the same interrupter, the same number of interruptions, the same quantity of current through the primary, the Dessauer instrument of 18 cm. spark length gives a current through the tube of 0.1 milliampere, while the other instrument of 50 cm. under like conditions gives a current through the tube of 0.8 milliamperes.

By using a soft tube the R. G. S. instrument gives 4 ma., while the Dessauer gives 2 ma. There was no inverse discharge in the first instrument and a marked inverse discharge in the second. A softer tube can be used with the large coil than with the small one.

In general the author concludes that the large inductors are of more value in every respect, that they are more easily regulated, and are more durable. He also concludes that for short exposures the Wehnelt interrupter is better, while for long exposures the mercury interrupter is best. The principle of construction in the Dessauer instrument differs in no way from those of other makers, and does not entitle it to the designation of a "System."

6. Walter has also made some investigations with the Dessauer instrument and comes to practically the same conclusions as those given in the above paragraph by Berger. The investigations by both men were extensive, and should be conclusive. Walter also concludes that a small instrument of another make, costing only 250 marks, will do the same work as the Dessauer instrument, which costs 435 marks.

7. The conclusions reached by Albers-Schönberg are of the greatest practical importance. He has kept a complete record of the use of each tube and the conditions under which it was used, and concludes that the life of a tube used with an 80 cm. coil is more than three times as long as when used with a 40 cm. coil. The small coil used in this instance was the Dessauer instrument. At the same time he found that the work done by the tube in connection with the large coil was more satisfactory. In order to get satisfactory results with the small coil it was necessary to use a ventril tube in series with the Roentgen tube, while with the large coil none was used.

JAHRBUCH DER RADIOAKTIVITAT UND ELEKTRONIK

Leipzig, Germany, May 5, 1905

1. The Definition of Radioactivity — Frederick Soddy.
2. The Alpha Rays of Radium — W. H. Bragg.
3. Radioactive Properties of Air, Earth, and Water — Richard Schenk.
4. The Rays of the Sun — J. H. Poynting.
5. Dissipation, Reflection, and Absorption of the Cathode Rays — W. Seitz.
6. Concerning the Theory of Electro-Capillarity — F. Kruker.
7. The Radioactive Minerals, Stones, and Springs — Georg V. D. Borne.

1. Soddy discusses the definitions given by other men, and especially the two given by Karl Schaum:

"1. Radioactivity is a property of matter involving an independent change in its atomic relations by reason of which ions are emitted.

"2. Radioactive substances include all of these individual chemicals which by independent change give off ions."

Soddy thinks that ions should be omitted from the definition and that the definition should not be based upon an electrical but a chemical change.

2. Bragg states the following hypotheses, and then demonstrates them by means of experiments and diagrams:

a. The ionization of the radiated gases, and therefore also the absorption of the penetrating rays, is nearly propor-

tional to the density of these gases.

b. The alpha rays do not permit of reflection, therefore they will cast a definite shadow after they have penetrated a substance such as a thin layer of aluminum.

c. Alpha rays which are given off from the specified object with the same original speed must come to rest at the same time when their energy has been spent. Within the affected field the gas becomes ionized; without this field no change occurs.

d. Very little "secondary" ionization occurs, least where the dissipated particles rest. This secondary ionization, however, plays an important role in connection with the beta rays.

e. An atom with greater speed must become positive by penetration of material. It cannot go far without losing an electron. Rutherford has concluded that the alpha rays appear to be neutral at the beginning. When an atom has lost an electron, it will scarcely lose another, because the combination has thereby been strengthened. Possibly the material which shows induced radioactivity is in this way rendered positive. When the atom of "emanation" breaks away, the remainder as well as the alpha particle becomes ionized through the jarring.

3. Schenck found that the coefficient of electrical tension depended upon the strength and the direction of the wind, and also upon the clearness of the atmosphere, but was independent of the temperature and the moisture. All of the earths studied were found to be radioactive; likewise the air of the earth and springs.

4. The sun's rays, when passed through a prism, is separated into its various colors. Each color has a definite wave length, varying from 1/30,000 of an inch in length in the red to 1/80,000 in the blue or violet. This is only part of the stream of rays which are recognized by the eye. Beyond the violet are rays of shorter wave length which effect a photographic plate or which penetrate the substances which are ordinarily considered opaque. Beyond the red are rays of longer wave length which are recognized as heat. This can be recognized by passing the rays through a vulcanite plate, which will cut off all ordinary light rays, but which will give evidence of heat by their effect upon a thermometer placed underneath. Up to the present time, the waves of energy radiating from the sun have been observed to extend over nine octaves; of these nine only a little over one octave is appreciable to the eye. The scale is already known to extend from wave lengths of 1/400 of an inch to 1/4,000,000. Not only light producing objects, but all objects give forth radiated energy. Cold objects give forth only waves of short length. Substances that are black when cold will give forth more visible rays when heated than any other.

5. Seitz reviews the literature upon this subject, and presents it in a condensed form so that no abstract can do the article justice. This same remark applies to the next two numbers, which are reviews.

LE RADIUM

Paris, France, June, 1905

1. The Cooper Hewitt Mercury Vapor Lamp — Maurice Leblanc.
2. Researches on the Radioactivity of the Air of the Soil — H. Geitel.

1. The author begins by a brief history of the development of the mercury-vapor lamp and explains the various phenomena at the anode and at the cathode of a tube filled with various vapors under different conditions.

Mr. Cooper Hewitt has been studying the subject for the last 9 or 10 years, and his various discoveries and his ex-

planations of the new phenomena are brought out in detail. The so-called cathode "repugnance" is explained and the part it plays in the operation of the lamp.

As most readers already know, the lamp in its simplest form consists of a glass tube about 70 cm. long and about 3 cm. in diameter. One end, the upper, is enlarged into a bulb and contains a cup-shaped iron electrode which becomes the anode of the device. A small amount of mercury at the lower end is the cathode. In series with the lamp and connected at the anode end is a resistance and an adjustable self-reduction.

The well-known greenish color of the light given by mercury vapor when glowing under an electric discharge is spoken of. Also some experiments of de Recklinghausen in mixing some other gases such as argon and helium with the contents of the tube are given. These were conducted with a view to correcting this serious defect, but have not been successful.

This lack of red is not entirely without advantage in some situations, however. The Hewitt light has been found admirable for its non-excitable character, and it is also excellent for photographic purposes.

As glass absorbs ultra-violet light, lamps have been made of quartz for special use in phototherapy in the treatment of lupus.

Most normal lamps take 3.5 amperes of current and have an efficiency of about 0.45 watts per candle power. Several special forms of bulbs are described.

2. This, the first of a series of articles on the above subject, begins with an introduction stating Mme. Curie's early hypothesis for explaining the emission of energy in radioactive phenomena. She suggested the possibility of all space being constantly traversed by rays like Roentgen rays, but far more penetrating, and stopped only by the bodies of greatest atomic mass like uranium and thorium. This theory was advanced prior to the discovery of polonium and of radium. The emission of secondary rays by bodies in the path of Roentgen rays had been discovered by Perrin and studied in detail by Sagnac and others. So that the radioactivity of substances might be really secondary rays induced by these space rays. If the space rays had a fixed direction then the radioactivity of any given specimen should change during the earth's rotation and should be less down a deep shaft. An experimental test of this gave negative results and as our knowledge of radioactivity has grown, all such ideas have been abandoned since we now know that there is marked difference between Becquerel rays and the secondary rays which are like Roentgen rays. After this brief introduction follows a few comments on the loss of electric charge in the air, and the part played in this loss by water vapor and dust. A brief history of this subject from the time of Coulomb is given.

The article ends by a brief discussion of some questions of meteorology calling attention to the work of Erman, of Peltier, of Exner, of Linss, and especially of Elster in conjunction with the author.

SOME PHYSICAL AIDS IN THE TREATMENT OF SCIATICA

John T. Rankin, *California Medical and Surgical Reporter,* April, 1905

Rankin desires his remarks to be understood as having reference only to cases amenable to other than surgical treatment. The pathological findings in sciatica are chiefly inflammation of the nerve sheath. In the acute stage the nerve becomes softer than normal, there is some swelling, and at times slight interstitial hemorrhage. As the condition becomes more chronic the nerve becomes harder than normal, and the walls of the blood vessels are thickened. Slight degenerative changes may occur in severe cases. As a result of perineuritis, contractions and adhesions may be found along the nerve. Any remedy for this disease should, therefore, be anti-congestive and eliminative on the one hand, nutritional and stimulative on the other; it should be capable or relaxing contracted tissues, of freeing adhesive bands and of relieving the pain which is the almost universal accompaniment.

Thermotherapy and hydrotherapy are very great helps in sciatica, but on account of the difficulty of proper application outside of sanitaria Rankin merely mentions the fact of their efficiency.

Manual treatment is of considerable importance. The tender areas along the course of the affected nerve from the lumbar region to the heel should be outlined. Then the patient should be laid prone upon a firm unyielding couch and the operator should begin at the circumference of the tender area, using the balls of the thumbs, and apply outward and downward pressure, graduated according to the acuteness of the pain, from the periphery towards the acute center of the sensitive area. The area about the sciatic notch should be manipulated first and afterward the areas of acute soreness on the leg. Where the pain and inflammation extend to the sciatic plexus and the lumbo-sacral cord deep manipulative treatment should be given along the lumbar spinal gutter, and, with the patient on the back, deep and carefully-executed pelvic massage should be practiced. In persons with thin and lax abdominal walls great benefit will be noticed from this procedure. As a further procedure for relaxing contractions, freeing adhesion, and opening up the circulation the operator may place his thumbs, one on each side of the nerve, beginning at the popliteal space, and apply deep and alternate pressure along the course of the nerve to the sciatic notch. After this "dry stretching" should be used as follows:

"With the patient on his back, let the operator flex the leg upon the thigh and the thigh firmly upon the abdomen. While the thigh is kept in this flexed position, gradually extend the leg as far as tolerance will allow. At the same time flex the foot firmly upon the leg. Hold in this position for 10 to 20 seconds, then relax and repeat as before, going through the proceeding four or five times. Considerable traction is brought to bear upon the nerve by this plan of stretching. As a further stretching and relaxing measure to the structures about the hip, the physician should perform internal and external rotation while the leg and thigh are fully flexed.

"These manipulative procedures should be persisted in perhaps daily, or thrice weekly, for a period ranging from two to three weeks to that many months."

Mechanical vibration produces the same effects as manual treatment and should be applied along the same general

lines, care being taken not to use enough force to produce bruising of the tissues.

The success obtainable with the electric currents will depend very largely upon a proper selection of the current to be used with regard to the individual case and the technique of its administration. All kinds of electricity are by no means the same.

The high-frequency current derived from the Oudin resonator has given Rankin considerable satisfaction as an analgetic application. As he has always used it in combination with other measures, however, he does not feel qualified to state what its actual value is. His best results were obtained by the use of high-frequency sparks from a glass vacuum electrode attached to the solenoid, applications lasting from 5 to 10 minutes, passing the electrode along the course of the nerve just elevated above the skin.

The galvanic current is very useful and where there is much pain or tenderness, the positive pole is usually to be preferred; applied through a sponge-covered hand electrode four by five inches, which is moistened with warm water; negative electrode should be five by six inches in size and placed against the sacrum. The positive electrode should be placed over the tender points and the current passed until relief from pain is obtained; usually from 4 to 12 minutes. Then change the positive electrode to another painful spot and pass again.

The induced or faradic current is valuable as an auxiliary to other methods. The electrodes and positions should be the same as for the galvanic current and if the nerve is in a condition of acute inflammation the rapidly-interrupted fine wire coil should be employed; if the condition is chronic the muscle-contracting current of slower interruptions should be selected.

Of the static modalities he has secured the best results from the wave current, the brush discharge, and the spark; the two first-mentioned in acute cases, the spark in chronic cases. He applies the wave current for from 15 to 25 minutes. Considerable caution must be observed in the application of the static spark as some cases are made worse by it; mild treatment therefore should be given with small sparks until the patient's confidence has been secured, when large, thick sparks should be applied. Fourteen or fifteen large, thick sparks will usually produce decided relief in these cases.

As a good combination of these different modalities he recommends that "In these recent cases where the pain is rather sharp and the nerve very sensitive, light manual manipulation of the acute areas, followed by a ten-minute application of an ascending continuous current, to reduce the irritability of the nerve, should be given, preferably every day, until the pain and tenderness are much diminished, and then treatment three times per week is generally sufficient. It works well, at times, to alternate the manual and the continuous current method, with mechanical vibration or the Morton wave, and a high tension induced current.

"In the chronic cases, vigorous manual treatment, heavy static sparks and the continuous current, should be administered as frequently as the condition demands. Do not use them all at the same seance, but alternate as will best suit the purpose in view."

NEURASTHENIA

J. Thomas Wright, *Jour. A. M. A.*, July 1, 1905

Wright considers neurasthenia to be a disorder of general metabolism especially involving the nutrition of the nerve cells and through them, affecting the functions of various organs of the body. Its principal causes are over-strenuous

living, excesses, overwork and worry. It may be due also to various exhausting diseases and heredity is often an important factor. There is a close relationship, he states, between neurasthenia and the sexual function and disorders of the female genital apparatus are sometimes its cause. It occurs usually between the ages of 15 and 45.

While often difficult to treat, the prognosis in non-hereditary cases is generally good. The treatment must first be directed to the cause and must be moral as well as medical. Graduated exercise, open air and sunlight, correction of habits when necessary, withdrawal from over-stimulating surroundings or modes of life, sleep and plenty of it, and at the beginning of the treatment, absolute rest, are all advised. The judicious use of massage, electricity, and hydrotherapeutics is also of value. In the severer cases, the Weir Mitchell rest cure may be employed. As hypernutrition is an end to be sought, frequent feeding with easily digested liquid foods is advised, and the eliminating organs must be kept active by appropriate remedies. A mild but invigorating climate and change of scene are often of utility. Patience and perseverance are necessary in the treatment and it is one disease in which tactful suggestive methods often give most brilliant results. The patient's own coöperation is most important for the attainment of satisfactory curative results.

Among drugs, Wright has found glycerophosphate of calcium, in 3-grain doses, and nitrate of strychnia the best builders, with compound syrup of the hypophosphites a good second. Hypnotics may be sometimes required. He has found the sulphocarbolates and creosote useful for the fermentation and diarrhœa incident to the disease.

ELECTROTHERAPY

A REPORT OF THREE ADDITIONAL CASES OF THORACIC ANEURISM AND ONE OF INNOMINATE ANEURISM TREATED BY WIRING AND ELECTROLYSIS

H. A. Hare, *Therapeutic Gazette,* July 25, 1905

Hare has already reported eight operations of this character, the three now reported making a total of eleven in his own experience.

The first of these three cases occurred in a woman of 50, the aneurism involving the superior and posterior portions of the transverse arch of the aorta in such a manner as to include the origin of the large vessels arising from this part of the aorta. The occurrence of severe symptoms made relief imperative and gold wire to the amount of 8 feet was passed into the sac through an ordinary insulated needle, and through this wire was passed the electrical current started at 5 ma. and gradually increased to 50, for 30 minutes. The immediate effect of the operation was to relieve the pressure symptoms and for several weeks afterward she was able to sleep in a reclining posture with perfect comfort. Six months after the growth began to enlarge at the margin of the clot and death finally occurred from pressure and exhaustion. Autopsy confirmed the diagnosis in every particular and revealed the wire embedded in the clot.

The second case occurred in a man 42 years of age, and was probably traceable to heavy lifting. There was some paralysis of the right vocal cord, but no interference with swallowing; the growth

filled the epiclavicular space at the right side, and passed backward under the sternomastoid muscle, pushing apart the bellies of the two branches of this muscle and protruding prominently into this space. Two feet of gold wire were passed into the tumor and the current passed as before, from 5 to 50 ma. being used in the course of 40 minutes. The patient was relieved immediately after the operation, and his voice soon returned to some extent. Four months later, however, he died from exhaustion and pressure. Autopsy confirmed the diagnosis, but strangely enough no trace of the wire could be found in any part of the clot.

The third case occurred in a woman 50 years of age, and involved the thoracic aorta just below its descending portion, having eroded the ribs upon the left side so that the sac projected to the extent of two inches outside of the line of the body between the vertebræ and the lower third of the left scapula. Nine feet of wire were introduced and the current passed as in the preceding case, from 5 to 50 ma. during a period of three-quarters of an hour. The immediate effect of the operation was to diminish the expansile pulsation. At the end of four months, however, the patient had died from pressure of the tumor and exhaustion. Autopsy confirmed diagnosis and revealed the wire embedded in the center of the clot.

Hare summarizes the results which he has observed in these 11 cases as follows:

"In practically all the cases the operation was followed by immediate relief of the pressure symptoms, and a diminution in the expansile pulsation of the part operated upon. The degree of relief varied very considerably, but all of the patients experienced some benefit. Several of them volunteered the information that they felt amply repaid for the operation and the relief which they obtained.

"Second, in each instance the ultimate death of the patient in no way proved that the operation was at fault. It indicated only that the disease in the blood vessel wall was so extensive that the point of greatness weakness having been re-enforced, the vessel then gave way at the margin of the clot, and at a place where operative interference could not well be undertaken.

"Third, in each instance the operation probably prolonged life.

"Fourth, while the number of cases of aortic aneurism which have been treated by this method are now quite numerous, instances in which a saccular aneurism of the innominate has been so treated are very rare; indeed, at the present writing I know of no other case of pure innominate aneurism treated by this method, although in a number of instances the innominate has been involved in the aneurism of the aorta.

"The operation is performed under desperate circumstances, and the fact that it does not produce a permanent cure in every case in no way militates against its employment. It will be remembered that in Stewart's case, which involved both the aorta and the innominate, the patient lived for a period of three years, dying at that time from an attack of penumonia due to a debauch, and not from the aneurism."

OUR ELECTRIC BATHS

Dr. O. Schliep, *Therap. Monatshefte,* June, 1905

This is in the main a plea for the so-called four-cell bath (Vierzellenbad) as constructed by Schnee. Each arm and leg is in a separate vessel. A reliable cataphoric effect is possible; the electric current goes entirely without any loss through the body; even very sick patients for whom dressing and undressing is a hardship can now bathe, and in cases of heart disease, for instance, we may

now expect results that were impossible before.

How is the curative effect of the electric bath to be explained?

The faradic current causes primary or secondary muscular contractions, augments the blood capacity of the muscle, influences reflectorily the metabolism. Weak nerves are invigorated by a weak faradization.

The constant ascending current also has a "recreative" effect which is polar, catalytic, cataphoric, and a solvens for inflammatory products. It acts either directly or reflectorily on the nerves and blood vessels.

The osmotic forces in the body are omnipresent and never at rest. They are the cause of the electric currents in our bodies.

Whenever there is infection, debility, stagnation, in the organism we have the most adequate remedy in the constant current, especially in the form of the four-cell bath, which is particularly valuable for its cataphoric effects and may be called a rival of surgery in the treatment of gallstones, perityphlitis, and other inflammations.

RADIODIAGNOSIS

THE VALUE OF THE USE OF A SHADOWGRAPH URETERIC BOUGIE IN THE PRECISE SURGERY OF RENAL CALCULUS

E. Hurry Fenwick, *British Medical Journal*, June 17, 1905

Fenwick thinks very highly of the X-ray as a help in the diagnosis of renal calculus and says that without it at least 22 per cent. of cases would be needlessly operated upon. He bases his opinions upon an experience with 500 operations upon the kidney, but the X-ray alone will not always give us absolute findings as regards position of abdominal calculi. Calcified mesenteric glands will cast shadows which may closely simulate those due to ureteral calculi, and the object of the paper is to show how this error may be eliminated.

When shadows resembling ureteral calculi are found in a Roentgenogram, Fenwick passes a ureteral bougie with a metallic core and then has the patient Roentgenographed with the bougie *in situ*. If the stone is in the ureter the bougie will either be found arrested at the point occupied by the stone, or the shadow cast by the stone will be found to coincide with that cast by the ureteral bougie. If the stone is not in the ureter, however, it will be found at variable distances away from the bougie. Eight illustrations accompany the article, showing Roentgenographs containing shadows which appear to be ureteral calculi, and also those in which the ureteral bougie was passed and another Roentgenogram taken which demonstrated that the shadow-casting bodies were not in the ureters.

CARCINOMA OF THE MALE BREAST CURED BY THE ROENTGEN RAY

Sinclair Tousey, *Medical Record,* July 29, 1905

The patient was a man 33 years of age from whom Tousey removed a tumor of the right breast, demonstrated by microscopical examination to be carcinoma, in November, 1902. In May, 1903, patient returned with a tumor of the left breast, somewhat softer and not so adherent to subjacent parts as was the tumor of the right breast, but it exhibited greater tenderness. X-rays generated in a 35 cm. Gundelach tube of 2½ inch spark resistance excited by an 8-inch induction coil with a Caldwell interrupter and using a primary current of five amperes, the anti-cathode being at a distance of nine inches from the skin, were applied. Exposures lasted 9 minutes and were applied once a week for the first five months and after that twice a week, the tube being placed nearest the affected breast, but the rays being allowed to reach the entire front of the chest and axilla. The skin was kept constantly somewhat reddened and exhibited a scaly desquamation, but at no time was the reaction sufficient to produce swelling, or tendency towards ulceration.

After five months' treatment the tenderness disappeared, but it was seven months before the tumor began to diminish in size and it did not entirely disappear until 11 months after inauguration of X-ray treatment. He has had no treatment for 13 months and there is no sign of recurrence.

This case is typical of a class in which the greatest degree of malignancy has not yet developed and no metastases have yet occurred, and he believes that such cases are sometimes susceptible of cure by Roentgentherapy.

TREATMENT OF INOPERABLE CASES OF MALIGNANT DISEASE OF THE ORBIT BY THE X-RAY

Charles Stedman Bull, *Medical Record,* June 24, 1905

The ophthalmic surgeon has for years been searching for some method of treatment for inoperable cases of malignant disease of the orbit or for cases of rapid recurrence in cases already subjected to operation by the knife. The writer has carefully studied the published reports of cases treated by the X-ray and has not been favorably impressed by them, some of them reading like fairy tales. Drs. Walther and Bechere report case of young man operated upon several times for sarcoma of orbit and considered inoperable, who was cured by eighteen sittings of X-rays, causing disappearance of the neoplasm. Professor Burger treated with equal success a case of recurrent sarcoma of the face. This case was subjected to a number of operations including resection of the superior maxilla and ligation of the external carotid artery. Under treatment by the X-ray the tumor entirely disappeared.

When any new treatment is introduced into medical practice it is at once grasped by some hysterical enthusiasts, and the most extravagant claims are made for it. It seems, however, to be an established fact, that the X-rays do sometimes cause the sloughing and disappearance of carcinomatous growths of a superficial character. It has not been possible to accurately determine the dosage of the X-ray.

We all admit that every case of malignant disease (not including the adjacent sinuses), should at once be extirpated by the knife, but the consensus of opinion seems now to be that if the sinuses are involved, a complete removal by the knife is useless and impracticable. It

would seem not only wise, but our duty, in these cases after removal by the knife, to use the X-ray to destroy such cells of a malignant character as cannot be removed by operation. Epithelioma and carcinoma yield more readily to the X-ray than sarcoma. Many cases have been reported as benefited, but few have been completely cured, the tumors have shrunken, but the patients' general condition has not improved. The writer has seen it stated that metastasis is more common in cases treated by the X-ray than by the knife. The writer's experience from his own cases has been that the pain complained of by the patients in these cases is generally speedily removed by the X-rays and usually does not return. The writer therefore recommends the X-ray treatment in all inoperable cases.

He has not observed any bad effects from the use of X-rays in these patients and records the histories of ten cases from his own practice. Of these ten cases two were apparently cured, one being an epithelioma and the other a carcinoma. The remaining eight cases, in which no demonstrable effect was produced by the X-rays, were all sarcomata.

LEUCOCYTHÆMIA TREATED BY THE X-RAYS, WITH A RECORD OF FOUR CASES

Charles H. Melland, *British Medical Journal*, July 1, 1905

Melland reports upon four cases of leucocythæmia treated by Roentgen radiation. The first patient was a woman aged 57, in whom the disease had existed for over a year. The right border of the spleen extended just to the middle line laterally, and inferiorly well down into the iliac fossa, the lower part being distinctly tender. Its longest diameter measured 10 inches. Examination of the blood showed hæmoglobin 61 per cent., red corpuscles 3,360,000, white corpuscles 426,000. A large proportion of the leucocytes were myelocytes, but the exact differential count was not made. Patient was somewhat anæmic and had been losing flesh.

The X-ray treatments were commenced on June 30, 1904, and given twice a week to the spleen for 20 minutes, the tube being about 4 inches from the abdominal wall. Absolutely no medicinal treatment was given, as it was desired to determine positively what would be the effect of the rays. The treatment extended over a period of 9 months (the number of applications not being given) by which time the percentage of hæmoglobin had risen from 61 per cent. to 95 per cent., the red corpuscles from 3,360,000 to 4,850,000, the leucocytes had dropped to 19,400, the percentage of myelocytes was diminished, but there still persisted a number of nucleated red corpuscles. The spleen had steadily contracted until it now projected beyond the edge of the ribs only about 4½ inches. The patient's general condition had been remarkably improved. After the first few weeks the X-rays were applied to the knees as well as to the spleen for 12½ minutes in each situation.

The second patient was a young woman of 23, who had the disease for some months and has lost considerable flesh. Bad pain at times in the left side of the abdomen and occasionally slight bleeding from the nose. Very anæmic. Spleen was very considerably enlarged, hæmoglobin 38 per cent., red corpuscles 2,085,000, leucocytes 141,000, myelocytes 29.8 per cent., nucleated red corpuscles 564.

Treatment was applied twice and sometimes three times a week to the spleen for an average of 12½ minutes. The spleen markedly diminished in size and she improved greatly generally, had a better color and better appetite. Her temperature, however, was hectic.

After a month's treatment hæmoglobin had increased to 68 per cent., the

red corpuscles to 4,460,000, and the leucocytes had diminished to 6,000, myelocytes 19.7 per cent., nucleated red corpuscles 60.

She did not improve generally as would have been expected from the changes in the blood and spleen, which is probably accounted for by the presence of tuberculous infection, which developed unmistakably in about a month, soon resulting in her death.

The third patient was a man aged 43 years, who presented a typical case of spleno-medullary leucocythæmia. Spleen was much enlarged.

X-ray treatment was begun on October 25, 1904, and was accompanied by small doses (5 minims) of Fowler's solution. On this date red blood corpuscles were 3,570,000, white blood corpuscles 548,000, myelocytes 38 per cent. X-ray applications were given twice a week for about 12½ minutes on an average for the first three months, and for 20 minutes afterward. It was necessary to interrupt the arsenic several times because of gastric disturbance produced thereby. By April 9, 1905, the spleen had not decreased very much and felt very firm and immovable. Hæmoglobin was 84 per cent., red blood corpuscles 5,000,000, leucocytes 198,000, myelocytes 29.0 per cent. Is greatly improved generally and able to keep regularly at his work, eating and sleeping well. His only complaint is that he is unable to hurry or walk up hill much; is gaining flesh.

The fourth patient was a woman aged 43, with tumor of the abdomen and spleen, which filled up practically the whole left side of the abdomen, extending across the middle line 3 inches to the right of the umbilicus; spleen firm, hard, and almost immovable. Hæmoglobin 70 per cent., red blood corpuscles 3,460,000, white blood corpuscles 542,000, myelocytes 34.8 per cent., nucleated red blood corpuscles 1,084.

X-ray applications commenced February 10, 1905, and were given to both spleen and knees, 12½ minutes duration to each locality, twice weekly. April 18, 1905, hæmoglobin was 100 per cent., red corpuscles 4,660,000, white blood corpuscles 190,000, myelocytes 23.4 per cent., nucleated red cells less than 380. General condition was greatly improved, abdominal girth has decreased to 38½ inches, and she is getting ready to resume her professional duties as a music teacher.

Although these cases are not as yet finished and it is too soon to draw conclusions as to the permanency of the improvement, yet Melland feels that they demonstrate that the X-ray is capable of influencing the essential features of this disease in a marked manner. The changes in the blood, the contraction of the spleen, and the improvement in the general conditions form a very strong triumvirate in favor of the treatment and the assumption that the essential pathological process is materially influenced thereby. The article by Ledringham and McKerron, which appeared in the *London Lancet* of January 14, 1905, abstract of which will be found on page 52 of THE ARCHIVES for February, 1905, is referred to at some length.

THE TREATMENT OF RINGWORM OF THE SCALP BY THE X-RAYS

T. M. H. MacLeod, *British Medical Journal*, July 1, 1905

MacLeod considers the X-ray treatment of ringworm of the scalp to be now established on a firm basis. He has treated 60 cases of small-spored ringworm of the scalp in children by this method at both the Charing Cross Hospital and at the Victoria Hospital for Children, with very satisfactory results. In no case has a serious dermatitis resulted from the rays.

His apparatus consists of a 10-inch coil with a "dipper" mercury break, a

Muller tube, and a d'Arsonval milliamperemeter in the secondary circuit. He estimates that with the tube resisting a 4-inch spark, a current of one-half ma. flowing through the secondary circuit on a dry day, and the anode 6 inches distant from the scalp, a treatment of 15 minutes duration is usually sufficient to produce depilation; when the weather is humid the exposure must be lengthened. He believes the treatment to be effective through its power to depilate the areas exposed without destroying the hair papillæ; the rays are not believed to kill the fungus.

The first step in the technique is to crop the hair short with the scissors. If impetiginous crusts or scurf are present it is then treated with a mild antiseptic ointment, such as precipitate of sulphur and vasoline, which is rubbed in daily after washing. The areas of ringworm are then marked out with a blue pencil for about a quarter of an inch beyond their margins. A lead glass cylinder of a size sufficient to expose each area is then selected and the various areas treated *seriatim;* if the ringworm be widely disseminated the whole scalp could be exposed at once, the sound areas being protected by sheet lead. It appears to be more efficient and satisfactory, however, to use the cylinder and expose portions of the area *seriatim.* The point is to have all of the affected areas thoroughly and uniformly exposed.

For at least three weeks after the exposure the scalp should be treated thoroughly with some mild parasitic ointment to stop the spreading of the disease.

About the fourteenth day after the exposure the hair begins to fall out and this process is complete in about a week. Slight transient erythema may accompany the defluvium. If the hairs have not completely fallen out by the twenty-first day a second exposure is given. Healthy hairs fall out more readily than the diseased hairs.

New hairs begin to appear about six weeks after the defluvium and the growth is usually completed in about five months. This slowness of the regrowth is looked upon as an advantage rather than otherwise, as it gives time for all the diseased hairs to be eradicated before new hairs grow in.

THE TREATMENT OF DISEASE WITH THE ROENTGEN RAYS

W. P. Goff, *N. Y. Med. Jour. and Phila. Med. Jour.,* June 24, 1905

The author details the four following cases:

Case I. — He saw the patient in October, 1903, when she gave the following history: Married, age 50 years, general health had always been good. About one year previous to first seeing her, she noticed small red spots on fingers, which rapidly transformed into large blisters, remaining as such for about three days, then disappearing, which took about three days' time; then the hand remained normal for two days, when the same condition would reappear and take the same course as already mentioned. The blisters contained a cloudy fluid, and the patient stated she had received much relief during each attack by opening them. She had been treated by several physicians. The condition became so bad on one finger that the latter was amputated — this before the blebs had ever appeared on the hand or wrist. He applied the Roentgen rays daily for a week, the exposures lasting from five to ten minutes, and after that twice and three times a week for the same length of time, until towards the end of December. At the end of the first week quite a dermatitis appeared, which lasted for about a week, during which time there was disappearance and return of the blebs as already stated. At the end of the third week, the blebs entirely disappeared, and until this time there has been no indication of their re-

turn. He gave thirty exposures in all, but believed that the good result obtained could have been reached much sooner had the patient lived where she could have taken treatment regularly, or at such times as was thought advisable.

Case II.—A. N. L., aged 52 years, general health good, noticed about two years ago a slight abrasion on the cheek, but thought nothing of it at the time, until a crust formed, which upon becoming detached while bathing the face, left a small ulcerated spot, from which occasionally a few drops of blood flowed. After six months the growth began to spread more rapidly, and with the spread of the ulceration there was itching and some pain. After four months of treatment the trouble disappeared entirely.

Case III—A. B. H., aged 59 years, noticed about December 1, 1903, tenderness and redness over the sternum, which gradually increased in extent until small ulcerated spots appeared, from which at times would flow a few drops of watery fluid, and later some pus. He was first seen March 11, 1904, and was told that he had been using different salves for the past four months without any beneficial results. His general health was much impaired. The day that the treatment was begun, a nodular condition was apparent, which, according to the statement of the patient, began about two months previously. The exposures in this case lasted from eight to twelve minutes, having been given four times a week for three weeks, and about twice a week thereafter until towards the end of June, 1904. No improvement was noticed until after the first month. The soreness and inflamed condition gradually disappeared, and today the patient experiences no trouble whatever. His general health has much improved, and the nodular condition has entirely disappeared.

Case IV.—R. B., aged 55 years, 28 years previously was struck under the eye with a pitchfork, making two punctures of the skin, one quite deep, which bled profusely for a few minutes. At times it gave evidence of healing completely over, but did not do so entirely, always breaking down before the process of healing was completed. The process of temporary scabbing over had continued for the past 28 years, but recently — within the previous six months — the infected area had seemed to increase somewhat in size. In this, as in the others, each exposure lasted from 5 to 8 minutes, 17 exposures being made in all. At the end of 12 exposures quite a dermatitis had appeared, and treatment was discontinued for a week. The patient is now well.

THE TREATMENT OF SOME NEURALGIAS BY THE ROENTGEN RAY

C. L. Leonard, *American Medicine,* July 8, 1905

Leonard reports eight cases, six of neuralgia, one of neuritis, and one of scar tissue of the brain following the removal of a cyst from the motor area five years previously, in which the Roentgen ray was the main element of treatment.

All of the six cases of neuralgia were due to impaired metabolism of the nerve tissues. The first was infra- and supraorbital neuralgia following an attack of influenza; the pain was relieved by the first treatment of three minutes and cured permanently by four more such treatments. The second was a severe neuralgia of both inferior and superior dental nerves, which had lasted 7 months and was accompanied by loosening of the teeth; three five-minute applications upon each side of the face every other day relieved the pain entirely; "the teeth resumed their proper place, and at the end of eight treatments he was entirely well. He has remained so for the past two years."

The third was a case of migraine

which had existed for ten years, resisting various kinds of treatment. The first application lessened the intensity of the pain, and at the end of the course of treatment (number of applications not stated) she was entirely cured.

The fourth case was trigeminal neuralgia and was much relieved, but patient discontinued treatment after four weeks and has not since been heard from.

The fifth was a case of brachial neuralgia; this patient also discontinued treatment prematurely.

The sixth was a case of severe *tic douloureaux* with crises almost every five minutes. The first application relieved the pain, but the patient left town after four treatments, promising to report if he had any further attacks; he has not since been heard from.

The case of neuritis occurred in the facial nerve and evidence of degeneration was shown by areas of local anæsthesia over its entire distribution, the point of most intense pain being over the mastoid region and the posterior surface of the ear in the distribution of the posterior auricular nerve. This patient was greatly relieved, but not entirely cured, possibly because the treatments were not applied with sufficient regularity.

The patient in whom it was attempted to produce absorption of scar tissue had complete paresis of the right arm with glossy skin on the fingers and absence of wrinkles; the arm could not be raised voluntarily. Right leg was also somewhat lame. Slight epileptiform attacks which had occurred recently were attributed to a recent blow upon the occiput. As a result of the X-ray applications the epileptiform attacks became less severe and frequent and the patient gradually gained control of the arm and hand so that he could raise the hand to his head and mouth and could grasp objects of moderate size. There was also decided improvement in his gait and speech. He received 12 applications in 6 weeks, the rays being applied through the trephine opening in the skull. As the bromides were continued in increasing doses with the Roentgen applications it is considered possible that the result cannot be attributed exclusively to the rays.

Leonard appears to believe that successful treatment of such cases is very largely dependent upon a proper technique and it is to be regretted that he did not describe that which he used more fully.

THE TREATMENT OF STRUMA WITH ROENTGEN RAYS

Dr. R. Stegmann, *Münch. Med. Woch.*, June 27, 1905

The author has treated two cases of goitre with Roentgen rays and employed the following technique:

"Medium hard tube, current of 4 amperes and 30 volts, Wehnelt interrupter, Walter arrangement, focal distances 35 cm." (The size of the coil is not mentioned.)

Case I.—Woman 52 years old. Was operated upon for carcinoma of left mamma in October, 1904. In April, 1905, Roentgen treatment was begun on account of metastases of pigeon's egg size, in the fossa supraclavicularis. The left lobe of a struma of many years standing was also included in the treatment.

April 11, 1905, first radiation 15 minutes.

April 18, 1905, second radiation 15 minutes.

April 27, 1905, third radiation 15 minutes.

The left side of the goitre is distinctly softer than the right one; the carcinomatous metastases also are softer.

May 13, 1905, fourth radiation 15 minutes. The left lobe is getting smaller and softer.

May 16, 1905, fifth radiation 8 minutes. The metastases have changed into a dough-like mass in which the glands

can no longer be differentiated. Slight œdema in radiated area.

May 19, 1905, sixth radiation 15 minutes. The left lobe of the struma reduced to one-quarter of its former size. The metastases cannot be felt Slight œdema, on account of which the Roentgen treatment is for the present discontinued.

Case II.—Girl, 21 years old. Notices that the neck has pretty rapidly become thicker during the last year. Large goitre and dyspnœa when she exerts herself.

Status præsens shows a pretty large parenchymatous struma of soft consistency. Circumference of neck 39.8 cm. (about 16 inches). As patient can only stay for three days, two Roentgen treatments, each of 18 minutes' duration, are given on March 25 and 27, 1905, one-half from the right, the other half from the left. Without signs of any reaction, either of a local or a general nature, the struma diminishes from the second week on. On May 18, about seven weeks after the radiations, the largest circumference of the neck is only 36 cm., a reduction of about 4 cm. (1½ inches). The dyspnœa has disappeared.

A SAFETY X-RAY TUBE

Henry G. Piffard, *N. Y. Med. Jour. and Phila. Med. Journal,* July 15, 1905

Previous methods of protection of the operator have been both costly and cumbersome. This tube is designed especially for the protection of the operator. It consists essentially of a tube made of lead glass with a window in the line of the most direct rays, which is one inch in diameter. This window is made of flint glass. It was found to be impractical to make the tube six inches in diameter, so a tube four inches in diameter was made, and an auxiliary bulb was attached for the purpose of steadying the vacuum. A palladium regulator similar to the Gundelach design has been added. Two tubes were made after this design, one by an English maker and one by Matchlett of New York. The opacity of both are about equal. The Matchlett tube, however, is stronger, and more substantial.

By tests with the electroscope it was found that the lead glass occluded about sixteen-seventeenths (16/17) of the ionizing rays. When this evidence is taken in conjunction with the Roentgenographic and Roentgenoscopic evidence the author concludes that this tube is reasonably safe, so far as the operator is concerned. The tube is intended solely for therapeutic purposes; it has not been found satisfactory for Roentgenography.

RADIUM TREATMENT OF CANCER OF THE ESOPHAGUS

Max Einhorn, *Jour. A. M. A.,* July 1, 1905

Einhorn describes his method of treating cancer of the esophagus with radium and gives its results. The instrument itself is illustrated in Fig. 1, and "consists of a rubber tube (about 17 F. diameter) which is provided with a mandrin and a capsule, the lower part of which is made of hard rubber and the upper part of metal. The two halves are screwed together. The upper part of the capsule is provided with a screw thread by means of which it is attached to the tube portion.

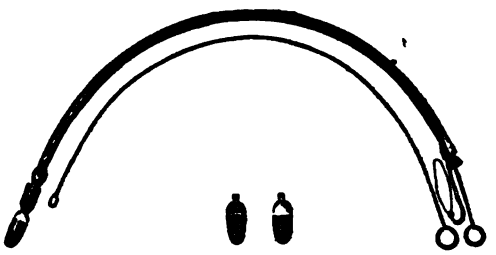


Fig. 1

Einhorn's Esophageal Radium Receptacle with Tubing and Mandrin

"The capsules are made in three different sizes to fit strictures of various widths."

His method of using it is to place the radium vial in the capsule of the instrument and screw the latter tightly together. The apparatus with the mandrin is then immersed in warm water, introduced into the esophagus with the patient in a fasting condition and sitting position, and pushed forward to the stricture. Introduction of the instrument will be facilitated if the tongue is depressed with the left index finger and the instrument held like a pen in the right hand, compressing it somewhat so that the mandrin will remain in place. When the stricture has been reached, as evidenced by resistance, the mandrin is removed and the end of the rubber tubing fastened by means of a thread to the ear of the patient. The instrument is allowed to remain in the esophagus from one-half an hour to an hour.

When removing the larger capsule it is wise to have the patient swallow when the cricoid cartilage is reached, so as to overcome the resistance encountered at this point. The instrument should then be washed, and it is susceptible of easy disinfection. This same instrument may also be used in gastric carcinoma by introducing it into the stomach.

Accompanying is a table showing the results in six cases just treated at the German Hospital:

RADIUM APPLICATIONS IN SIX CASES OF OESOPHOGEAL CANCER (EINHORN).

Name.	Age.	Length of Treatment.	Result of Examination by Bougie.		Remarks.
			At Beginning of Treatment.	At End of Treatment.	
1. A. S.	52	Feb. 22–Mar. 9 1905 (16 days).	Bougie 32 F. encounters resistance 15¾ in. from the teeth.	Bougie 39 F. encounters resistance 16½ in. from teeth.	Patient feels somewhat better.
2. A. G.	55	Mar. 9–Apr. 6, 1905 (29 days).	Bougie 20 F. encounters resistance at 17⅛ in; bougie 39 F. at 16½ in. from teeth.	Bougie 42 F. encounters resistance at 17½ in. from teeth.	Patient has improved considerably. He can swallow better and has no pain.
3. A. K.	38	Mar. 22-Ap. 20, 1905 (30 days).	Bougie 20 F. encounters resistance at 17 in. from teeth, but passes thro'; bougie 39 F. can be inserted only to 16½ inches.	Bougie 43 F. passes into stomach without resistance.	Patient has gained and can now take semi-solid and even solid substances.
4. C. M.	39	Apr. 6-28, 1905, (23 days).	Bougie 20 F. encounters resistance at 14¾ inches; bougie 39 F. at 16½ in. from teeth.	Bougie 52 F. passes into stomach without resistance.	Patient feels better; she can take semi-solid and some solid food.
5. L. Z.	50	Ap. 13-28, 1905, (16 days).	Bougie 26 F. encounters resistance at 15 in.; bougie 39 F. at 14 in. from teeth.	Bougie 52 F. passes into stomach without resistance.	Patient can now take solid food; has gained 8 pounds.
6. B. B.	53	Ap. 10-28, 1905, (19 days).	Bougie 25 F. encounters resistance at 11 in. from teeth.	Bougie 35 F. encounters resistance at 12½ in. from teeth.	Ability to swallow has not particularly improv'd. Has brought up at times a little bloody mucus, especially after the radium treatment; slight rises in temperature occasionally.

As will be seen in three of these cases while the stricture did not become passable yet the bougie could be introduced deeper; in the other three the stricture became passable for rather thick bougies (43-52 F.). Improvement was usually observed inside of a week, all the patients felt better than they did before treatment, five could swallow better, the three in whom the stricture became entirely permeable were able to take semi-solid and even solid food, and the pain was less in five of the six patients. Einhorn believes that the radium treatment of esophageal cancer may be considered as promising something for the future.

RADIUM BROMIDE IN THE TREATMENT OF RODENT ULCER

Sir Alan R. Manby, *British Medical Journal*, July 1, 1905

Manby reports three cases of rodent ulcer, two of which have been cured and one greatly benefited by the application of five mg. of radium bromide contained in a glass tube (strength of the preparation not stated). The first patient had an ulcer over the right malar bone two inches long by three-quarters inch wide. Twenty-six applications, averaging 20 minutes and extending over a period of three months, were made, at the end of which time the whole surface was covered with a delicate but natural-looking skin. Several months later, after a severe bronchitis, two little scabs appeared at each extremity of the old scar about three-eighths inch in diameter. These were removed after 14 applications of an hour each, but Manby is afraid it will break down again.

Another case presented an ulcer similar to the foregoing. Eleven applications, averaging 50 minutes each, were made, and the ulcer became so perfectly healed that it was difficult to discover its former location, except in a good light.

The third case was a little recurrent ulcer following influenza. He was given seven applications of 50 minutes each every day, at the end of which time the hair had all fallen out and the ulcer was rapidly cicatrizing. At the present time he is entirely well.

A CONTRIBUTION TO THE KNOWLEDGE OF THE EFFECT OF THE RADIUM IN OUR MEDICINAL SPRING WATERS

Dr. A. J. Kalmann, *Wien. Klin. Woch.*, June 1, 1905

The author has made experiments on the growth and metabolism of bacteria under the influence of the emanations of the Gastein thermal water. As the biological object of experimentation he selected the bacillus prodigiosus. As sources of radiation he used thermal water emanations, spring gas emanations, sedimental crusts, and a small quantity of pure, very active "Reissacherite" (a mineral discovered by Prof. H. Mache in the sediment of the water). Without going into the details of the author's extensive research work we append his conclusions:

1. The examined emanation retards and injures the growth and the metabolism of prodigiosus.
2. This effect is directly proportional to the intensity of the radioactivity.
3. Thermal water which was older than 48 hours and spring gas older than 8 days were devoid of any emanation.

PSYCHOTHERAPY

A RARE CASE OF PHOBIA

Dr. Timpano, *Journal of Mental Pathology*, Vol. 7, No. 1.

In the report of a phobia of reading in which the patient was seized by uncontrollable vomiting at each attempt, the author rather narrowly differentiates the different species of phobias, classifying them as degenerative, neurasthenic, and psychæsthenic. Of the first the positive mark lies in the incorrigibility of the fixed idea, in its strange and phantastic tone and the presence of physical stigmata. In the neurasthenic the phobias are intermittent, not so fixed nor so phantastic with, however, more disturbances of digestion and greater tendency to exaggerate the present state. In the psychæsthenic also the phobia is more coercible, while the tendency to false reasoning, and to pessimism is greater.

This is a sad example of classification gone mad, for the very attempt at this division shows only too plainly the interconnection between these forms as Janet has developed so well in his Psychæsthenia. The case is of interest because of its unusual form and the implications contained therein, although undeveloped by the writer.

PERCEPTION AT A DISTANCE

Dr. Sollier, *Annales de Psychologie*, March, 1905

In a discussion and explanation of a case presenting rather unusual features of widely extended peripheral fields, the author follows the laws of perception rather than invoking the telepathic interpretation. The case, who could detect change in position and approach of objects toward herself with visual stimuli eliminated, was shown to present a marked sensitivity of the skin to minimal stimuli of heat, cold, currents of air, etc., not normally presenting.

This is quite analogous to the heightened perceptive powers, the hyperamnesia seen in hypnoid and hypnotic states. The reporting of the case shows a considerable deficiency in exactness of detail.

LEICHT SCHWACHSINNIGE ALS ZEUGEN

Dr. Ranshburb, *Centralblatt für Nervenheilkunde*, March, 1905

Author elaborates a test series of questions involving real and fictitious associations. The tests rest upon distinguishing between these two factors by the subject. Before presenting them to the defectives, however, they were tried upon normal children at varying ages. From the age of 7 to 12 it was found that in the normal child the per cent. of failure was high, averaging about 25. On approaching the 14th to 16th year, however, this percentage rapidly diminished to one-quarter of the previous figure. In the defective per cent. of failure in early years is little more than the normal, averaging from 35 to 50. That which is significant is the fact of this figure here remaining stationary rather than diminishing as in the normal.

It will be seen that the author has seized upon the developmental aspect as that containing the true criterion; he has drawn his figures from varied ages in both classes, showing, on the one hand, a marked deficiency at an early age in the normal which changes as the mind develops, but, on the other hand, an equal or greater deficiency in the normal during early years which, however, does not change as the usual developmental periods approach.

PERSONAL EXPERIENCE IN THE EMPLOYMENT OF MECHANICAL VIBRATION IN THE TREATMENT OF RECTAL DISEASES

William L. Dickinson, *Detroit Medical Journal,* July, 1905

Dickinson reports three cases of irritable anal ulcer, which had existed for variable periods, which he has cured by mechanical vibratory stimulation. He vibrates the first, second, third, and fourth lumbar nerves with a hard rubber ball vibratode, making pressure upon each nerve for about 12 seconds and vibrating each one twice, using a short stroke with 4,000 blows per minute. Then the small anal vibratode is lubricated with vaseline and applied to the anus gently while the machine is in motion. It is thus introduced slowly into the anus. There is a little discomfort at first, but after a few seconds it passes away and the vibratode can be applied comfortably. The process should be maintained for three minutes and treatments given every day for five or six days and then every second day until the patient is well.

Dilatation of tight anal sphincters can be brought about in this same way, employing five thousand short strokes per minute and gradually introducing the instrument. It requires about one minute to fully introduce the vibratode, which is then held in place half a minute and then carefully withdrawn. Repeating this procedure three or four times will fully relax the spasm. Stimulation of the third and fourth sacral nerves is very beneficial in some of these cases. If these ulcerative cases do not respond in two or three weeks he does not consider it worth while to persist.

He considers the results obtainable in chronic constipation to be remarkable, and recommends that errors in diet should be corrected in addition to applying vibration, but deplores the use of any laxative medicines. He recommends the following technique for the treatment of chronic constipation: the patient lies upon the back with the knees drawn up to relax the abdominal muscles and the rubber brush vibratode is passed four or five times along the ascending, transverse and descending colons, beginning at the ilio-cecal junction, with medium hard pressure; this is followed by light stimulation of the vagi at the sides of the neck. The patient is then turned over on his face with the arms extended upward and passed around the end of the table to elevate the ribs, and the hard rubber ball vibratode is applied from the fourth to the twelfth dorsal nerves with medium stroke and pressure; this is to stimulate the nerves controlling the intestinal tract and rectum. Stimulation of the rectum is additionally made by using the same vibratode with heavy pressure and medium stroke, over the third, fourth, and fifth lumbar, and the second, third, and fourth sacral nerves. Treatments should be given daily until bowels move regularly and then every third day for two or three weeks.

CLIMATOTHERAPY

THE SEA AIR TREATMENT OF SURGICAL TUBERCULOSIS

Charles L. Wallace, *Medical Record,* July 22, 1905

This is a preliminary report on the results of one year's treatment of surgical tuberculosis at the Sea Breeze (Coney Island) experimental hospital. Twenty-four cases have been under treatment, many of them being in a far advanced and apparently hopeless stage on admission.

Four elements entered into the management of the patients, viz.: (1) sea air, night and day; (2) cheerful surroundings; (3) simple food; (4) orthopedic treatment. Rain or shine the children are kept out of doors the entire day except for two hours in a tent-school on the beach, and at night they sleep in wards where all the windows are open during even the coldest weather, being of course protected by ample covering. Patients unable to walk spend their time in bed upon the second floor veranda.

Under this régime the little patients are comfortable and happy. A few days of gradual acclimatization habituates them to the out-door life and they do not mind the cold. Only one slight case of bronchitis has occurred and coughs and colds are unknown. Various childrens' games and sports are indulged in on the beach, and the interior of the hospital is made as cheerful as possible, the nurses being chosen not alone for their professional ability, but also for their sympathetic interest in the needs and requirements of children.

The dietary is abundant and of the best. There are five meals a day, breakfast, dinner, supper, and two luncheons. A half hour before rising the windows are closed and the wards warmed for dressing. At half after six the children rise and breakfast at seven on cereal, bread and butter, and milk, and a choice from broiled minced beef, or eggs, or baked potatoes and bacon, or stewed fruit. After breakfast they are out of doors until 9 o'clock, when they go to school in a tent on the beach for two hours, with a recess at 10, during which a luncheon of milk and crackers is served. Then they play and have short calisthenic exercises, all out of doors. At 12 they have dinner, consisting of a choice from either roast beef or lamb, or stewed beef, or lamb or chicken and rice, or broiled fresh fish, or minced fresh beef, with two vegetables chosen from the following: peas, beans, potatoes, rice, spinach, carrots, and macaroni. They are allowed an unlimited quantity of bread and butter and milk with cream. For dessert there is either some milk pudding or ice cream, or baked apples and cream. After dinner the children play out of doors until supper time, with a luncheon of milk and crackers, and fruit at three. At five they have a very light supper of bread and butter, toast, and milk, with either stewed fruit, or eggs, or a cereal.

Directly after supper the children from 3 to 7 years of age are put to bed, the older ones retiring at 7. The surgical dressings are completed in the morning by 10.30.

The medical treatment of the cases is based on general principles, no special plan being followed. The orthopedic methods are the same as those in general use except some modification of the usual hip and knee apparatus to admit of easy locomotion on the beach. Wallace's experience with the sea breeze cases leads him to believe that tuberculous sinuses heal more readily and permanently when all packing and drainage tubes are omitted, and only a sterile absorbent dressing applied.

During the short time the hospital has been in use the results have surpassed all anticipations. Patients have, with only one exception, gained in weight and bodily strength, sinuses of long standing have healed, and acute pain has rapidly subsided. It appears to be proved that out-of-door treatment in surroundings normally adapted to child life is more effective than the best possible treatment in wards. Fresh air is essential in surgical as it is in pulmonary tuberculosis. whether out-of-door salt air is more efficacious than out-of-door inland air is still *sub judici*. It is hoped that the speedy establishment of new hospitals at selected points will allow this apparently beneficent method of treatment full trial.

Special Plates Illustrating

Stone and Tumor in Kidneys, Coxa Vara, and Tuberculosis of the Hip

Stone in kidney (urates) removed by operation. Taken with 22-inch coil; exposure 70 seconds.

By Dr. G. G. Burdick, Chicago, Illinois.

Coxa vara in adult; fracture of hip sustained in childhood.

Taken with 15 inch, specially constructed Carstarphen coil, (90 miles of No. 32 B and 5. gauge wire in the secondary, wound in pancake sections) mercury jet interrupter, exposure three minutes, low tube with spark gaps in series, and very small primary current. Seed plate.

By Dr. G. H. Stover, of Denver, Colorado.

Tuberculosis of hip in boy thirteen years old.

Skiagraphed with same apparatus as preceding plate, exposure 10 seconds, Cramer medium isochromatic plate.

By Dr. G. H. Stover, of Denver, Colorado.

Tumor of kidney, patient lying face down, stomach distended by Seidlitz powder gas.

Skiagraphed with same apparatus and technique as preceding, time 30 seconds, which was a little too much as the plate was over-exposed. Cramer medium isochromatic plate.

By Dr. G. H. Stover, of Denver, Colorado.

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EXPERIMENTAL RESEARCHES ON THE BIOLOGICAL ACTION OF FIELDS OF VARIABLE MAGNETIC STRESS

BY CARLO COLOMBO, M.D., OF ROME, ITALY.

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THE study of the action of the magnet upon animals and upon man is not a thing of today. Naturalists, physiologists, and physicians at all times have been occupied upon a subject so interesting.

"In ages very remote (4th century) Theodore Priscianus employed the magnet against headache, and Marullus the Empiric followed his example. L'Aeguieta relates that from the 7th century the magnet was considered as a remedy for disease perhaps by virtue of the hematite which it contains."

In these researches we have been greatly aided by Dr. O. Guzzoni degli Ancarani, our former assistant. He has assisted us in the investigation of a part of the bibliography, in the raising of silk-worms, and other subjects of experiment; he submitted animals to the action of the radiator, in experiments; he has taken note of the results obtained, following very carefully our suggestions. We owe to him our gratitude for assistance so valuable.

"In 1200, Albertus Magnus, a great admirer of the experimental method, did not overlook the magnet, and in many of his works he has indicated its power of affecting the human organism, either healthy or sick.

But the most zealous among the defenders of magnetic influence was one who lived at the dawn of the Renaissance (1493-1541), Paracelsus. Among the therapeutic means in which he had the most confidence, and which he not only frequently employed but tried also to bring into vogue, the magnet was the foremost. He did not use it empirically but according to certain scientific laws, and solely upon definite

morbid entities almost the same as those in which today one has recourse to this therapeutic agent: hysteria (called by him *mal de mere*), epilepsy, painful affections, hemorrhages.

The real founder of magnetic science is considered with good right to be Gilbert (1600). In one of his books—"De Magnete"—the illustrious English physician devoted a chapter to its therapeutic virtues and shows the influence of the magnet upon the human body.

The work of Kircher upon magnetism, which between 1660 and 1680 had many editions, proves that at that time this study was held in great honor, but it was only in 1750, a little after the discovery of means by which one may communicate with facility the magnetic force to iron and to steel (thus rendering more convenient and common the application), that the therapeutic use of the magnet began to develop.

Bohn, who lived at this time, relates in his books upon the magnet, that some clinicians and some physicists of ability and veracity favored magnetic therapeutics. Mesmer (1780) did harm perhaps to the progress of magneto-therapy, when he, declaring himself author of a new doctrine, entered upon the investigation of a "Hidden source of power" in the animal machine, and made it spring from the will itself. The most memorable age of the history of medical magnetism belonged to the close of the 18th century, when the influence of magnetism upon the human body was seriously studied by Audry and Chouret, to whom this task had been especially delegated by the Academy of Medicine of Paris.

These men who had studied the question came to the conclusion that there existed a real influence of the magnet upon the nervous system. They distinguished the cases in which the magnet had a beneficent action, from those in which the effect was bad; they noted also the symptoms which increase in intensity under such influence, such as fever, headache, fainting, vertigo, burnings, formication, prickings, etc.

In Italy, meanwhile, nothing noteworthy was done. There is to be noted only the observation of Morgagni, who first used the magnet to extract a particle of iron fixed in the cornea, causing the patient to feel that the pupil of the eye was drawn as by the magnet itself.

Then the experiments and studies upon magnetism ceased in France and in Italy; only at Naples in 1815 a certain Poli, a physicist, published a book in which he reported many cases of cure obtained by means of the magnet, all neuralgias and rheumatisms, but being only a physicist, he could not speak with great knowledge or credit on things concerning medicine.

Reil of Göttingen in 1825 devoted himself to the study and practice of magnetic medicine, whilst Becker entered the physiological field and began to classify the various difficulties of digestion removed by the new agent, and thus prepared the way for investigation of its physiological *modus operandi*.

Also Burdach, while confessing his doubts, admitted that the magnet displayed a certain influence on the human organism; and Reinchenbach at a more recent period (1845) by making extensive experiments upon individuals of both sexes, and differing from each other in age, temperament, manner of life, state of health, observed that of 20 persons exposed to the action of a strong magnet there were always three or four who felt the influence strongly.

The genial and highly speculative spirit of Charcot could not omit to study magnetic action upon the human organism. The observations, the researches, the studies made upon the subject by the eminent French pathologist, were numerous and of such a sort, that, in collaboration with Reguard, he was able in 1878 to demonstrate by a brilliant

experiment the influence of the magnet upon hysterical persons.

To the experiments of the Salpetrière, succeeded others in the psychiatric clinics of Reggio Emilia in which Teppilli and Maragliani confirmed the results of Charcot, Reguard, and Nigouroux. The happy results of these observers were then confirmed by Schiff and Benedict, and the latter, at Vienna, made celebrated the experiments of Charcot.

The most convinced and steadfast apostle of the therapeutic virtues of magnetism was, in Italy, Charles Maggiorani, who already in 1869 published a work on the action of the magnet upon the nervous system, and in 1878 issued a brief memoir as a preliminary note on the subject, which treated of the influence of magnetism on embryogenesis in the fecundated during their incubation.

He wished to demonstrate by his learned dissertation that, in eggs put under the influence of magnetism, the organic development was almost always retarded as compared with eggs free from that influence. Later, in 1882, he delivered a lecture to the Academia d'Lincei, in which he explained that the hens born from eggs influenced by the magnet were sterile, or with atrophic ovaries, while the cocks having a similar origin preserved well developed the characteristics of their sex and the capacity of fecundation. These investigations were, later, taken up by his son, Antoine Maggiorani, who proved that the already matured fœtus is influenced by the magnet, and he promulgated the theory that if the sex is not already determined it may be modified by magnetic action exerted upon the egg.

Carlos Maggiorani also conducted investigations concerning the influence of magnetism upon the cerebellum, calling attention to its influence upon the nerve centers. He noted a form of vertigo characterized by movements of the head, dimness of vision, trembling, and even in rare cases by nausea and vomiting. In certain asthenic forms, while the vertigo was lacking, there was a weakening of the whole body which, for a time, became incapable of motion. Maggiorani, impressed by the strong analogy existing between the symptomatic syndromes and lesions of the cerebellum, explained the fact on the theory that the magnetic lines of force had all been converged upon a common center in the cerebellum.

Magine and Antoine Maggiorani obtained more positive results in 1886 by investigating the magnetic properties of the blood, which behaves as do diamagnetic and paramagnetic substances which have been mixed.

The action of the magnet was also studied by Lombroso, alone and also in collaboration with Ottolenghi; but the experiments were executed wholly upon individuals easily hypnotizable, as well in the somnambulic as in the waking state. Bianchi had also observed the influence of the magnet, which Lombroso called "psychic polarization" upon those influenced by suggestion; but he observed nevertheless that it is not produced exclusively by the magnet, but also by other æsthesiogenic bodies. ("Burg on Metals".) The experiments made by Fere upon magnetic influence might have had a more positive value, if the subjects of the experiments had not been hysterical persons.

Some had already observed that the magnet did not act solely upon the sensibility, but also upon motility and muscular energy. Fere repeated the experiments upon the hysterical, some of them fatigued and others in a state of repose, employing the ergograph of Mosso. He came to the following conclusions:

When the magnet is applied to persons in repose, upon the arm which labors is produced a very sensible diminution of the work itself, compared with the ergograms obtained from the same persons without the application of the magnet;

if meanwhile the magnet is applied to the arm opposite to that which is at work the power to work is immediately increased as compared with the ergograms obtained under normal conditions.

Lord Lindsay and C. F. Warley caused to be constructed a special electro-magnet, very powerful, large enough to rest the human head between the two branches. When the head was placed between the poles, they could not observe any effect. In spite of this, Lord Kelvin, who relates these experiments, was convinced that a living body situated in a magnetic field, ought to feel a perceptible effect.

DuBois made the observation that, in experimenting upon different protozoa, he had not been able to note any perceptible effect. Verworn made the same declaration and arrived at the "complete certainty that magnetism is a form of energy which manifests no action upon living matter."

The subject is certainly interesting since Chevenau and Bohn have recently studied the action of the magnetic field upon infusoria, with a stationary or continuous magnetic field. These authors have obtained, on the contrary, important modifications in the conditions of life of these animals, by employing a field very intense and of long duration.

Recently Braham and Graf have tried to influence photographic plates with a magnetic field, but their results were contradictory.

More recently Gutton, collaborator of Blondlot, by studying the action of a magnetic field upon fluorescent substances, decides that the magnetic waves comport themselves in this respect precisely as the N-rays; that is to say, that they increase the luminosity.

The most ancient among the observations and researches related above, relate to the influence of the natural magnet, that is, the magnet of loadstone of variable size and consequently of variable intensity.

The most recent authors, on the contrary, since Volta's discovery, make use of the solenoid, constituting electro-magnets sometimes of very limited power, sometimes of very great, but always with polarity constant.

More lively becomes the interest of physicians in magnetic phenomena since Konrad Mueller published his studies on powerful electro-magnets with a variable field, constructed by himself and capable of developing lines of great force by means of alternating currents.

Immediately therapeutics seized on these and the marvelous results were published everywhere, but the enthusiasm for the discoveries of Mueller himself and of his imitators did not immediately eliminate all the railleries of the sceptical, who recalled the contradictory experiments of many ancient and modern physiologists, and above all the researches, very carefully conducted, of Hermann which led to the conclusion that the magnetic fields have no action upon living organisms, whether of inferior animals or of man.

To explain these opposite and plainly contradictory results, Mueller and his disciples object that all the experimental researches and the empiric observations upon the action of magnetic fields, constant or stationary, are essentially different from those which are produced by the apparatus of Mueller, which we will describe farther on. The most important phenomenon upon which Mueller establishes himself to explain that his magnetic field ought to have a profound effect upon living organisms, is an optical phenomenon consisting of a flash which one perceives as much better marked as the illumination of the place where the experiment is made is the more intense; whilst with the eyes closed or in obscurity one is not able to perceive it. If the experimenter fixes his eyes steadily upon an object colored red, yellow, or blue, its color loses much of its intensity.

It is objected that this phenomenon

cannot be produced by electric currents induced in the nerves and muscles of the eye; Mueller replies by a series of considerations and experiments which, we ought to confess, prove effectually his contention; that is to say, that this phenomenon is due exclusively to magnetic action. To explain the phenomenon, Mueller proposes many hypotheses; he believes that the cause of the luminous phenomenon is perhaps a change in the chemical constitution of the blood in the regions influenced, or it may indicate an influence exercised by the field upon the chemical phenomena of the eye. To demonstrate this hypothesis, many experiments have been made, one of which remains celebrated. Vessels containing blood are submitted to the action of a magnetic field; the layer of serum formed from this blood is much larger than that in control specimens which are maintained under the same conditions.

As to the action of the magnetic field upon the blood, Kunznitzki also communicated to the last International Congress at Berne, experiments from which it results that the proportion of oxyhemoglobin contained in the living body increases sensibly after a magnetic irradiation of only 20 minutes.

Beer explains the phenomenon of the flashing in another way. He assumes that the waves of the magnetic field go to strike other magnetic bodies which are at rest, and the former, by vibrating, set in motion diamagnetic or paramagnetic bodies, and at the same time and for the same reason the parts of the eye and of its blood-content.

Frankenhäuser gave also to this phenomenon very great importance by assigning to it, for a cause incontestably magnetic, the continual change of polarity.

Rodari, on the contrary, taught quite another theory than this, on the action of this apparatus; the properties of the bipolar magnetic field permit to be drawn with great probability, the conclusion that the modality and the kind of therapeutic value in the diamagnetic reaction of the smallest parts of the organism, as also in the nerve-cells exposed to the influence of the forces mentioned, consist in this, that the bipolar undulatory magnetic field induces in the molecules of the nerve-cells and other tissues reacting diamagnetically, a very slight vibratory motion, and thus exercises upon them a sort of massage, making the effects eventually magneto-chemical.

Up to this point, we are in a field of objective phenomena which are subject to scientific control. In the therapeutic field the observations are rather more numerous and more favorable than in the field of experimentation.

The electro-magnetic apparatus of Mueller, as we have already said, has given rise since 1900 to a number of special institutions where this force is applied, in Germany, in Austria, and in Switzerland, to the treatment of numerous and varied diseases. Thus there have been published various statistics of cures, by Frankenhäuser, by Eulemberg, by Kraft, by Lindemann, by Lilienfeld of Berlin, by Beer of Vienna, by Rodari of Zurich, and by others.

All these authors insist on the calming and anæsthetic effect of the electro-magnetic field. Pains of every kind, acute and chronic, neuralgias, rheumatisms, etc., diminish after a brief application; it is the same for lancinating and flashing pains; this shows, according to Lilielfeld, that it is not done by suggestion. Afterward have been treated, with as great success, many nervous diseases, hysteria and neurasthenia. Phenomena the most varied, the most opposite, melancholy and excitement, forgetfulness and insomnia, find in the electro-magnetic current their proper corrective, either stimulating or moderating (Lindemann).

Though some of the authors cited have published the results of methodical researches, the frequent contradictions

between them leave the mind open to doubts.

On the other hand, the imposing mass of empirical observations, paralleling with a rare concord, the marvelous effects of the new electro-magnetic therapy, seems to admit this supposition; that the contradictory results obtained by the various experimenters who have labored in the investigation of the biological action of the magnet, should be attributed to the fact that they had not at disposal magnetic fields of sufficiently great power, such as one obtains by the radiator with variable fields invented by Mueller.

This much may well be affirmed, that, even if it was indisputable that, with the magnetic field employed hitherto, no objective action upon living organisms was capable of being established, this does not exclude, *a priori,* that with the instrument of Mueller, much superior in power to the preceding in that it constitutes an energy almost altogether different, some effect may be observed.

Stimulated by this idea, we commenced our researches by a first series of experiments which we now publish, which were limited to the study of the psycho-chemical action of the magnet and to its biological action upon the inferior organisms, deferring to a future publication the results of our observations upon the higher animals and upon man, from the double view point of the physiological action and the therapeutic role.

II.

For our researches we employed a magnetic field, very powerful, with variable polarity produced by a Konrad Mueller radiator, constructed by the firm Hirschmann of Berlin. It is provided with a rheostat, and amperemeter, and stopcocks to regulate the circulation of the water destined to cool the electro-magnet.

This last is situated in a box in the form of a drum closed at both ends by flat plates of marble; a round hole covered by a plate of mica, discloses one extremity of a core of soft iron which serves as a pole. The electro-magnet consists of a bobbin upon which is wound a wire in about 200 turns; in its interior this solenoid has, for an axis, a paramagnetic core of soft iron constituted of parallel plates, parts of which are pierced with holes. In the box is a coil of lead-pipe through which passes constantly a current of cold water, which serves as a refrigerant for the apparatus; with the use of alternating currents of a high intensity, one cannot avoid a considerable degree of heat. A current of great intensity, which can be raised to 35 or 40 amperes, passes into the solenoid where it develops very intense self-induction currents, of which the lines of force are concentrated in the axis of the solenoid or core already described.

The current which we describe is monophasic; it has a tension of 102 volts and a frequency of 43 periods to the second; that is to say, the poles of the magnet change name 86 times during this time period, and the same pole is 43 times in a second negative, and 43 times positive.

The lines of force which radiate from this apparatus constitute a magnetic field of which the influence is felt at 35 or 40 centimeters from the polar extremities. They have, therefore, the power of traversing an ordinary human body completely. That portion of the apparatus called the radiator is suspended by a metallic cord furnished with a special system of pulleys and counterpoises, and may be located at various heights by means of a suspensory on its cord, so that one of its poles may be set in any direction.

An electro-magnet so powerful possesses in a high degree all the physical properties of a magnet. It attracts great bars of soft iron and of pure nickel; it

repels aluminum violently. Iron filings brought near one of its poles arrange themselves in the form of rays around its axis, indicating by their diverging direction the lines of force which radiate from it.

Our investigations upon the influence of the magnetic field were divided into two groups:

First, the special physical properties of the electro-magnet.

Second, its biological action, studied upon the inferior animals.

PHYSICAL PROPERTIES OF THE VARIABLE MAGNETIC FIELD.

The aim of our study is not to pass in review all the physical properties of the electro-magnet, which everybody knows, but to verify the observations of Braham and of Gutton, who affirm that they have been able to influence with a magnetic field phosphorescent plates of sulphuret of lime.

Photographic Plates.

Braham used photographic plates to ascertain if there would be recorded thereon an impression of the lines of force which emanate from an electro-magnet, such as can be obtained by the use of other radiations. He exposed the plate to a powerful electro-magnet actuated by an alternating current, and when he developed the plate thought he had detected such an impression, which corresponded to the direct line of the magnetic flow.

On the supposition that these last observers were not able to obtain positive effects because they did not possess an electro-magnet of sufficient power, we repeated the experiment of Braham with a Mueller radiator. In a room perfectly dark, at night, to be more sure that the plates did not receive light, we put upon a table a photographic plate 9 x 12, with the gelatine side uppermost.

Upon this plate we placed many objects, e. g., a large ring of aluminum, a piece of silver, and filings of soft iron, for the purpose of learning better the impressions which the lines of force of a magnetic field leave upon the plate. We found that the aluminum was repelled, the filings of iron were attracted, and the silver remained indifferent. We thought that if the lines of flow had really the power of influencing the photographic plate, there would remain upon the gelatine the impression of the objects above indicated. Of these, that which most completely arrested the passage of the magnetic waves, would behave photographically as does light.

Above the plate, with the objects thus disposed, we arranged the radiator in such a manner that the axis of the solenoid was perpendicular to the plate, and one of the poles was above its center at a distance of 8 centimeters. We were thus sure that the plate entered wholly into the magnetic field and that the lines of force reacted in their greatest intensity. We launched then into the apparatus a current of 25 or 30 amperes, and allowed it to act for 30 minutes. Then we surrounded the plate with a triple sheet of black paper and proceeded to develop it. The development was long and careful, notwithstanding which we could not observe upon the plate any impression; we repeated the experiment many times, varying the distance of the radiator from the plate, the time of exposure, the intensity of the current. In spite of the application of all the inventions of the photographic art in the development of the plates, the result was always the same.

Screens of Sulphuret of Lime.

Gutton, assistant and collaborator of Blondlot, believed that the magnetic fields acted upon the eye and upon phosphorescent substances like N-rays. Blondlot had demonstrated that, to observe the N-rays, it was better to approach the source of these rays, rather than cause them to fall upon a body feebly luminous. One then perceives

more distinctly objects that are but slightly illuminated. If one causes a magnetic field to act upon the eye, and while it is acting, looks into a room almost dark, at small pieces of white paper or at marks traced with chalk, one sees them more clearly when one brings the eye near one pole of a magnet which is covered with lead foil. (Lead serves to arrest the N-rays emitted by steel.)

If one places near the eyes a long magnetic needle covered with lead foil, one sees better the illuminated objects if one brings the eyes near the *end* of the needle, than if one brings them near the *middle* part.

As to the action of phosphorescent substances Gutton concludes thus:

I. Magnetic fields increase the light of phosphorescent substances when such fields are produced by having placed lengthwise of a magnetized bar a piece of cord sprinkled with specks of phosphorescent sulphur. Gutton observed "the luminous property of the sulphuret of lime to increase in the vicinity of the poles, and to diminish near the middle of the bar. This action also takes place in a vacuum, for one can perform the experiment by placing below the magnet phosphorescent substances enclosed in a Crooke's tube."

With an electro-magnetic coil, if one places the sulphur near the outside, parallel to its axis, the luminous property is still very feeble in the middle portion and increases in the degree that one approaches the ends. In the interior of the coil, in the region where the magnetic field is uniform, one observes no effect. Finally, by placing the sulphur at one centimeter distant from a straight wire, the passage through the wire of a very feeble current will produce a considerable effect.

II. Only variable magnetic fields act in this manner.

III. Phosphorescent substances are of an extraordinary sensibility when exposed to variations of the magnetic field.

IV. In all the preceding experiments the influence of heat rays and of N-rays was eliminated by means of black paper and of lead. The author concludes from this that the effects obtained should be attributed to a specific action of the magnet, and not to heat rays or N-rays. We repeated these experiments of Gutton solely for that which concerns the action of the electro-magnet, as distinguished from the magnetized bar and the straight wire.

In a room almost dark we fixed on the wall in front of us pieces of white paper and traced thereon large letters with crayon; we approach the radiator within 7 or 8 centimeters of our head, in order that the magnetic field emanating from one of the poles might surround completely, not only the eyes but the whole face. With a current of 25 amperes we saw no variation in the luminosity of the pieces of paper or of the lines traced by the crayon. We tried then to bring the pole of the radiator near our eyes, up to the distance of 2 centimeters, but had no better success. We have never seen anything but the flash characteristic of magnetic variable fields of great power.

In the same dark room we repeated the experiment of Gutton with the screen of sulphuret of lime. After having put in action the radiator, with a current of 35 amperes, we placed before one of the poles at different distances, commencing at 8 centimeters, a screen 12 x 18 cm. of sulphuret of lime. After subjecting, during 30 or 35 seconds, the phosphorescent screen to the influence of the magnetic field, we withdrew it rapidly from the field itself without allowing the eye to quit it.

In other experiments we followed an opposite method: we observed the screen steadily during the 30 or 35 seconds, whilst it was outside of the magnetic field and then brought it into the magnetic field without ceasing to watch it. It was impossible to perceive any variation in the luminous intensity of the

screen. We obtained the same result (no evident influence) by moving the phosphorescent screen, in the interior of the radiator, parallel to its axis, from the middle part toward one of the poles, or from one pole to the other, passing along the middle line.

BIOLOGICAL ACTION OF THE VARIABLE MAGNETIC FIELD.

It is within our design to make a complete study of the biological action of the magnetic field, commencing with inferior animals and extending up to man. The completion of this study will certainly require a long time, so we think it convenient to apportion our researches to two periods: that is to say, to publish without delay our studies on the inferior animals, reserving for later publication the researches upon higher animals, as well as those relating to the physiological and therapeutic action of the magnet upon man.

It is thus that we proceeded. Our investigations on the inferior animals had for an object, determination of the actual influence of the magnetic field,

a. Upon the germination and growth of elementary organisms (infusoria).

b. Upon the incubation and hatching of eggs (of frogs and of silk-worm moths).

c. Upon the development and growth of animals (silk-worms).

d. Upon the conditions of life and the movement of each individual, observed during the action of the magnetic field (silk-worms).

a. Action of the Magnetic Field Upon the Germination and Growth of Infusoria.

Experiments had already been made with the magnet upon infusoria. In 1903, Cheveneau and Bohn gave their attention to the matter in the laboratory of M. Curie, of whom they were pupils. When submitting infusoria during several entire days (from 2 to 5 days) to the action of a powerful electro-magnet, with a constant or continuous field, of an intensity of 5,000 to 8,000 C. G. S., they observed a decrease in the intensity of the ciliary movements, an arrest in their individual development and in their multiplication. The authors describe their microscopic observations as follows:

The animals under examination, even while multiplying in the proportion of 1 to 4, always preserved their normal appearance, seeking their prey everywhere, crossing in every direction the magnetic field with a mean rapidity of 400 microns per second.

After the second day they changed their appearance, their movements became less lively, reaching a speed of scarcely 134 microns, and there was a considerable decrease in numbers, only 1/3, 1/4, and finally 1/13 remaining of those which were originally under observation. Not only was the multiplication slower, but the individuals of a new generation, instead of increasing rapidly in size, remained small (35 microns instead of 75 microns which is their normal size).

In certain cases (stylonichia) the animals died without reproducing. In the vorticellæ the color of those living indicated already a progressive alteration of the protoplasm. That the action of the magnetic field is then very decided is the conclusion of these authors.

At the same time that these authors were experimenting, Grenet, without knowing of their work, experimented upon the paramecii produced by the maceration of hay at the temperature of the laboratory. These paramecii contained in a capillary tube of glass, closed at the ends, were put into a solenoid; the current was furnished by Bunsen piles at a tension of 1 to 5 volts each. The current was regularly interrupted by an interrupter like that of electric bells. The intensity of the magnetic field was nearly 100 units C. G. S.

About one-half hour afterward some

paramecii had become motionless; most had undergone a change of form; some had become spotted, and others seemed to have become mere empty shells.

The paramecii contained in a control examination tube during the same time had undergone no modification. The same experiments betrayed no alteration in the paramecii when he submitted them to a constant magnetic field by suppressing the interruptions.

Grenet concluded from this that the specific action observed in the paramecii, might be due only to the variations of the magnetic field; but that would be in contradiction to the experiments of Cheveneau and Bohn, cited above, who had observed the like phenomena with a constant magnetic field.

At all events it is not denied that this action could be attributed to the production of the induced currents of Foucault in the conducting organisms, currents which would act upon the infusoria by killing them, — like currents in general.

This second hypothesis is, to us, the more acceptable, when it is recalled that the infusoria were not exposed to the lines of force which radiate from the exterior of a magnetic field, but that they were placed within a solenoid inside of the field itself, constituting as it were, the core of a coil, and because of that fully subject to the influence of induced currents. For that reason also we cannot attribute a convincing and absolute value to the experiments of either, as regards purely magnetic influence.

We wished to observe these matters for ourselves, and experimented with a true magnetic field, well defined, produced by the Mueller radiator, and submitted infusoria to the action of the lines of flow which radiated from it, but outside of every possible influence of induced currents. We further used applications of the same intensity and of the same duration as those which have been used in practical therapy; for it would be absurd to think of keeping patients under the action of a magnetic field for four or five days without interruption, or even for four or five hours.

In March, 1904, and many times since, we have put at the same time into infusion, hay in two little basins containing water at 24° c., and have then kept the basins in a room, the temperature of which was kept almost uniform. We kept apart one of the little basins for a control, under the same conditions of temperature and of medium as the other which was subjected daily to the action of the magnetic field. The experiment was arranged in such a manner that the lines of force of the magnetic field should impinge perpendicularly to the surface of the infusion, which was placed at a distance of 10 cm. from the active pole, and the application was prolonged for 30 minutes.

The germinative paste which contained the colonies of infusoria on the surface of the hay, and from which came the odor characteristic of putrefaction had developed itself in the two basins to the same extent, on the fifth day of the infusion. Multiplication advanced equally in the two cases, as was confirmed by the microscope.

In our first observations we were able also to note, in the preparations made with the infusion contained in the basin influenced by the magnetic field, particular forms; a kind of globular paramecii, very large, very ugly and which we did not succeed in finding in the control preparations; but after repeated observations we had to undeceive ourselves for the same forms appeared also in the control preparations.

We made another observation, a remarkable one, on microscopic preparations of the infusion of hay. By causing the magnetic field to act directly on the microscopic preparation in such a way that the lines of force were directed parallel to the glass slide containing the specimens, which was located at a distance of from 3 to 5 cm. from the active

pole, the magnet being excited by 25 to 30 amperes, we observed in the infusoria of all kinds (paramecii, spyrostomes, vorticellæ) which crossed the field in every direction, very lively undulatory movements, temporary modifications of form of the great cells in the paramecii, very sudden movements in the cilia of the vorticellæ, and a rapid rotation around their axis in the spyrostomes. None of this, on the contrary, had taken place in the preparations upon which the magnetic field had not acted; here the infusoria crossed the field with movements more slow, without rotation, without undulations, and without change of form of the great cells; and also in the preparations in which were observed the phenomena noted above under the action of the magnetic field, these phenomena ceased immediately at the moment when one ceased to pass the current through the electro-magnet.

We have not been able to demonstrate a substantial influence upon the protoplasm of the infusoria, neither as regards multiplication nor the acts of nutrition or development; these phenomena were neither facilitated nor retarded, nor was the life period modified.

We are inclined to explain the facts brought out, by assuming that the very lively undulatory movements presented by the paramecii and the temporary and inconstant changes in their exterior form, as well as the sudden movements of the cilia of the vorticellæ, the rotations around part of their axis by which the spyrostomes were animated, may be impressed mechanically by the vibrations produced in the air by the magnetic waves radiating from the lines of force, and to which these very delicate organisms are sensitive.

Our hypothesis is shared also by Nodais, one of the most enthusiastic disciples of Konrad Mueller, and who explains also the action of the variable magnetic field upon man, by assuming that the nerve-cells are thereby subjected to a very feeble vibratory movement, a sort of massage which modifies their function.

b. Action of the Magnetic Field Upon the Incubation and Hatching of Eggs.

One doubtless, in Italy, knows of the studies of Maggiorani, continued later by his son Antonio, upon the influence which the magnet may have upon the fecundated egg in the course of incubation, and upon embryogenesis.

Maggiorani, the father, employed hen's eggs for his researches; he found that the organic development of eggs subjected to the action of the magnet during their incubation was almost always retarded as compared with eggs kept under ordinary conditions. Further, the eggs influenced by the magnet produced sterile females with atrophied ovaries, or very strong males with sexual characteristics very pronounced and a remarkable capacity for fecundating (from which Maggiorani, the son, came later to his conclusions; he evolved the hypothesis that the magnet is capable of modifying the sex of animals when one causes it to act, at a very early period of development, upon the embryo not yet sexually determined). The subject was of such a nature as to awaken our curiosity, and we have investigated the subject in connection with the eggs of the frog and the silk-worm moth.

Frog's eggs. On the 29th of April, 1904, pregnant frogs furnished a large quantity of eggs enveloped in an abundant mucilaginous substance. Of these eggs we made two separate divisions, which we placed in two different receivers. In receiver A (of porcelain) we put 600 eggs; in receiver B only 300. The eggs in receiver A were designed to undergo the action of the electro-magnetic field, while those in receiver B should serve for control. In order to keep the eggs well and to maintain them in conditions such that they should develop normally, we filled the two receivers with water, and to make renewal sure we

caused to flow through them a continuous stream by convenient means.

The water was at a constant temperature of 17°. The room in which the eggs were kept was spacious and well-aired and kept at a temperature, nearly constant, of 20° C. Beginning with April 30th, twice every day for 20 minutes each time, we caused to act, a magnetic field of 26 amperes, upon the frog's eggs contained in receiver A. The receiver was so nearly empty, during the exposure, as to expose the surface of the bed made by the eggs upon the bottom of the receiver. The electromagnet was arranged in such a way that its polar axis should be perpendicular to the surface of the layer of eggs. The distance of the active pole from this surface was 7 cm.

As we have said above, we excluded all action emanating from fields of electric induction, which might be formed accidentally by using a receiver of some insulating substance like insulating porcelain. Attentive observation during the whole time of application did not develop any phenomena in the mass of eggs which could be attributed to a direct action of the magnetic field upon the eggs themselves. We pursued thus our applications every day without observing anything noteworthy in the state of the eggs subjected to the experiment, or in those reserved for control.

About May 19th we thought it well to count the eggs kept in the two receivers, and we found 586 in receiver A (instead of 600) and 280 in receiver B (in place of 300). As we were absolutely sure that no egg could be lost, we must consequently attribute the decrease to a natural destruction of the eggs least resistant.

On the 25th of May we began to notice a diminution in the mass of mucilage which surrounded the eggs, but no indication of hatching.

On the 29th of May the outside temperature had risen much, and in the experiment room also was reached a temperature of 28° C. We noticed that in receiver B the mucilage began to be transformed into ash-colored pieces which fell to the bottom of the receiver, while the eggs remained uncovered.

On the first of June we noticed also a beginning of the destruction of the mucilage in receiver A. In receiver B the eggs were uncovered and seemed larger; their number tended to decrease; the vessel emitted an odor of sulphuret of hydrogen.

On the 2d of June every trace of mucilage had disappeared from receiver A. Upon the sides of both receivers was deposited a black paste. The odor of rotten eggs with sulphuret of hydrogen, continued all the time to issue; but the odor was stronger in vessel B than in vessel A, which was subjected to electromagnetic action. In this last the eggs appeared decidedly fresher and the paste attached to the sides of the vessel was less thick.

On the 8th of June, the eggs in receiver B were reduced to a shapeless black mud and were thrown away. The eggs in receiver A were less in number, but those which remained (about one hundred) were well preserved.

On the 22d of June, the eggs contained in receiver A commenced a rapid destruction which continued without interruption to the 25th of June, the day on which the eggs underwent the same transformations as those of receiver B, and were thrown away. The outside temperature in these days rose to 31° C., and even the water for renewing reached a temperature of 20° C. in the pipes.

From these experiments, during which the frogs' eggs under observation produced no tadpoles, neither those subjected to the action of the variable magnetic field or those reserved for control, it results that the eggs which had been subjected to the action of the magnetic field (receiver A) corrupted more slowly than those of the control (receiver B).

Meanwhile we may suppose that this

preservation of the eggs contained in receiver A was due in great measure to the fact that the water of this receiver was emptied to the bottom twice a day at the moment of electro-magnetic action, whilst that in receiver B, being renewed by a continuous stream, the fresh water did not reach to the bottom where remained water almost stagnant.

Eggs of silk-worm moths. A certain quantity of good silk-worm eggs, chosen by the firm of Luciana of Ascoli Pueno (and which were graciously offered by Prof. Lomonaco of the laboratory of experimental physiology) were subdivided into various lots. A large lot of 2,500 eggs was kept separate as a control, upon a card, for normal development; 3,000 other eggs were disposed upon special cards (in 6 lots of 500 eggs each) marked with the letters A, B, C, D, E, F. All these cards were kept in a dry room, well-aired, at a uniform and constant temperature of 22° C.

To learn in a definite manner whether the magnetic field exercised any positive action upon the development of the silk-worm, we thought best to make a registration of the effects which might be produced on the different lots, which were exposed many times and for variable periods of time to the action of the magnetic field.

Thus we were able to determine the varying influence of the magnetic field upon the different lots, proportionally to the duration of the exposure.

Here is how we managed our experiments: Lot A was kept as a control, under the same conditions as the other lots, except as regards the action of the magnetic field, to which it was never subjected. The five other lots, B, C, D, E, F, were subjected on each day, beginning April 14, 1904, to the action of a magnetic field of 26 amperes; but each lot during a special period of time; lot B during 15 minutes; lot C during 30 minutes; lot D during 45 minutes; lot E during 60 minutes; and lot F during 75 minutes. The longer applications were executed by exposing during several periods of 15 minutes each, and at different hours with regular intervals, as found indicated in the following table:

Lots.	1st App.	2d App.	3d App.	4th App.	5th App.
B	—	—	—	2.00 P.M.	—
C	—	—	—	2.15 "	6.00 P M
D	—	9.00 A.M.	—	2.30 "	61.5 "
E	—	9.15 "	11.30 A.M.	2.45 "	6.30 "
F	7.30 A.M.	9.30 "	11.45 "	3.00 "	6 45 "

The cards on which the eggs were arranged were placed under the radiator in such a way that its polar axis should be perpendicular to the surface of the card, and the active pole at a constant distance of 10 cm. from the card. During the action of the magnetic field we did not observe any peculiarities in the general characteristics of the eggs which could be regarded as a direct effect of the action of the magnetic field. The period of incubation commenced regularly with all the eggs placed upon the cards and kept at the favorable temperature of 22° C.

Nothing noteworthy was observed until the night of the 26th of April; then the little silk-worms commenced to hatch on all the cards without exception, including the control lot. The eggs continued on the following days to hatch incessantly till the 2d of May, the day on which the last eggs hatched. As fast as the little worms appeared they were taken from the incubation-card and placed upon another card, with fresh and tender leaves of mulberry to serve for their nourishment. The little worms issuing from each lot were kept separated, as were the corresponding eggs, upon as many cards designated by the letters A, B, C, D, E, F. The cards containing eggs not yet hatched were regularly subjected to the electro-magnetic application, following the same procedure explained above, and this was continued up to the hatching of the last

eggs. As fast as the little silk-worms grew they were carefully counted and classified. On the control card of 2,500 eggs, we had 1,660 births, a proportion of 66.4 per cent. On the other cards the hatching proceeded as indicated in the following table:

Lot.	No. of Eggs.	Eggs hatched April 27th, at		Eggs hatched April 28th, at			Eggs hatched April 29th, at			Eggs hatched April 30th, at		Eggs hatched May 1st, at		Eggs hatched May 2d. at		Whole number hatched.	Proportion of births.
		8 A.M.	9 P.M.	7.30 A.M	11 A.M.	4 P.M.	7.30 A.M	3 P.M.	7 P.M.	9 A.M.	2.30 P.M	8 A.M.	12 M.	4 P.M.	7 P.M.		
A	500	4	14	63	10	6	56	27	1	61	8	14	4	9	3	280	56.0%
B	500	14	17	57	14	6	6	51	21	51	12	38	6	13	5	311	62.2
C	500	26	35	35	76	19	3	44	19	60	16	26	8	7	3	377	75.4
D	500	12	15	66	26	4	4	42	28	17	25	25	10	13	8	295	59.00
E	500	11	15	56	24	5	5	44	24	21	44	44	8	7	7	315	63.00
F	500	9	16	41	14	7	7	36	22	29	33	31	1	17	3	266	53.2
T'tl	3000	76	112	318	164	47	81	244	115	239	138	178	37	66	29	1845	61.4%
Total eggs hatched for the day.		188		529			440			377		216		95			

According to this table the number of births the first day was small, only 188. It increased greatly on the three succeeding days, attaining April 28th, the number of 529. The 29th of April it was 440, and April 30th, 377. The 1st of May it dropped again to 216, and the 2d of May, the last hatching, it was only 95. This proportion was fairly uniform on all the cards. Consequently we are not allowed to conclude that, upon the cards influenced by the magnetic field, development was either hastened or retarded. If now we examine the total number of births in each lot we shall see that the proportion of eggs hatched on the 6 cards differed in all. We find in

Lot A (card of control), 280 larvæ, or 56 per cent.
Lot B (15 minutes of electro-magnet), 311 larvæ, or 62.2 per cent.
Lot C (30 minutes of electro-magnet), 377 larvæ, or 75.4 per cent.
Lot D (45 minutes of electro-magnet), 295 larvæ, or 59 per cent.
Lot E (60 minutes of electro-magnet), 314 larvæ, or 63 per cent.
Lot F (75 minutes of electro-magnet), 266 larvæ, or 53.2 per cent.

We should conclude from this that, as a general rule, the application of the variable magnetic field favored the incubation of the eggs and determined the hatching of a greater number, for on the card of controls the proportion of births was only 56 per cent., while on all the other cards, which were subjected to the influence of the magnetic field except F, it was greater than this. Our purpose in enlarging our observations by operating on a large number of cards was to permit us to learn more of the peculiarities; as these results are contradictory, the first conclusion is really compromised.

Second, as we had the greatest proportion of births in lot C, which received a continued application of the magnetic field for 30 minutes each day, one might conclude that the best duration of application of the magnetic field, that which most favored the development of the eggs of silk-worms, is a half hour; while a duration of greater or less length would be less favorable. But lot E comes in to disturb this logical deduction, for it turns up as a false note in the diatonic gamut of lots C, D, and F.

Still another contradiction takes away all value from the two conclusions stated. We have said that it could result from

the table above, that the action of the magnetic field favored incubation and determined the hatching of a greater number of eggs. Well, in the lot kept separate as a control and containing 2,500 eggs wholly uninfluenced by the electro-magnetic field, we found a proportion of births of 66.4 per cent., which is greater than the mean value of the proportion of births which took place in the lots subjected to electro-magnetic action. The action of the magnetic field would then have injured rather than favored the hatching of the eggs. So we believe ourselves authorized to conclude that the incubation and hatching of silk-worm eggs have followed, in these experiments, their natural course without feeling any influence from the electro-magnetic field.

c. Action of the magnetic field upon the development and growth of animals.

Our observations were later directed to ascertaining what influence can the action exercised by the electro-magnet upon the eggs in incubation have upon the successive development of the silk-worms?

To attain this end, it remained but to follow, day by day, the different cards on which were raised the silk-worms, and to note the differences observed in the rapidity of their development and in the vigor of their nutrition. This we did during the first days of May, 1904 (2d, 3d, 4th and 5th May) by watching the masses of silk-worms born on the cards A, B, C, D, E, F, and upon the controls, and we noted that upon

Card	A,	which contained	280,	4	were	dead.
"	B,	" "	311,	6	"	"
"	C,	" "	377,	8	"	"
"	D,	" "	295,	4	"	"
"	E,	" "	315,	19	"	"
"	F,	" "	266,	4	"	"

but we perceived that if it were a difficult and painful undertaking to watch so great a number of silk-worms while they were still small, it would become surely impossible when they had reached a higher degree of development. In consequence of this consideration we decided to throw away all the mass of larvæ, after having chosen 15 from each lot, of equal size and in conditions of health and vivacity which were similar, and we arranged them for raising upon 5 cards, with abundant food constituted of fresh and tender mulberry leaves. Of 1,660 worms born from the control eggs we also threw away the greater part, keeping only 48, which we arranged upon 2 cards, 24 upon one called G, and 24 on the other, called A. The observations of the following days (6th to 10th of May) gave no particular indication of possible variations of the larvæ in the different lots. On the 11th of May we began to notice some differences among the worms on the same cards. Most were well developed, of uniform size, lively and very voracious. Some appeared sensibly smaller, slower in their movements, less hungry. It is impossible to deceive ourselves when we observe facts of this kind.

The silk-worms of tardy development were divided thus:

0	in lot	A	(control).
0	"	A^1	(control).
1	"	B	exposed to 15 min. magnetic field.
4	"	C	30 minutes of magnetic field.
1	"	D	45 " " " "
1	"	E	60 " " " "
0	"	F	75 " " " "
0	"	G	(control).

Comparative observation of the different lots shows that those which present the most larvæ well developed are B and D. Lot C presents the greatest number of larvæ little developed. Lots A and A^1, which were not subjected to the action of the electro-magnetic field, present all their larvæ uniformly developed. Should one then infer from this that the magnetic field retards the development of the larvæ on which it has exerted its action while they were still in the eggs?

It is this view which we should take because of another experiment which we

also commenced on the 6th of May, upon the two lots A and G, containing larvæ from eggs which were kept separate for controls. Lot A was kept in reserve, lot G was subjected to a daily action of the electro-magnetic field of an intensity of 26 amperes; the polar axis was perpendicular to the card containing the silk-worms and at a distance of 10 cm. from the card itself. The action lasted 30 minutes. They presented clearly this difference: in lot A they were all well developed, of uniform size and notably larger than those on card G. These last were also not as lively in their movements and consumed fewer mulberry leaves. Still not convinced, we continued to observe the silk-worms being raised, and decided to verify yet again the results obtained.

We reflected that if the magnetic field retarded the development of the larvæ and weakened their functions of nutrition, we ought to find the number of larvæ least developed constantly increased in the lots of which the eggs had undergone the action of the magnetic field; and we ought even to find the development longest retarded in those larvæ which had been subjected longest to the action of the magnetic field.

On the 12th of May we took lot C, which contained 4 larvæ little developed and of which the condition was certainly not better than that of the larvæ contained in the other lots, and we subjected them to a daily action of the magnetic field of an intensity of 26 amperes, during a period of 30 minutes, arranging the apparatus as for lot G. Here is the result of our observations during May 13th, the number of larvæ exhibiting retarded development in each lot:

0 in lot A (control).
2 " A (control).
1 " B (at rest).
4 " C (magnetic field).
5 " D (at rest).
1 " E (at rest).
1 " F (at rest).
1 " G (magnetic field).

In pursuing our observations we were able to note distinctly that of larvæ retarded, on the 18th of May there were found:

2 in lot A (control).
2 " A (control).
1 " B (at rest).
2 " C (magnetic field).
3 " D (at rest).
2 " E (at rest).
2 " F (at rest).
1 " G (magnetic field).

On May 27th we still found of retarded larvæ

3 in lot A (control).
2 " A (control).
3 " B (at rest).
2 " C (magnetic field).
3 " D (at rest).
2 " E (at rest).
2 " F (at rest).
1 " G (magnetic field).

Instead of confirming the hypothesis stated above, that the action of the magnetic field manifested, as indicated by the development of the larvæ, influence in any direct manner upon the previous condition of the eggs, these results led to conclusions quite the opposite.

In fact, groups A, C, D, F, G, and above all, C, D, F, are those which indisputably present the best developed larvæ, the most uniform in size, liveliest, and most voracious, and they are precisely the silk-worms which had undergone the action of the magnetic field; D and F in the egg state, C and G in the larval state. But there is yet more. On the 12th of May, the worms raised on card C were not in a flourishing condition; we counted at least 4 but slightly developed. These 4 larvæ on May 18th in the progress of their development were reduced to 2, solely because 2 of them resumed their normal development.

Should we attribute this fact to the action of the magnetic field? No, certainly not; because a similar fact was observed in lot D, which was kept in re-

pose, without any action of the radiator. In this lot also there were on May 12th, 5 larvæ little developed, and on the 18th of May we found but 3.

On the other hand we determined an increase in the number of retarded larvæ in group A, which had never been subjected to the action of the magnetic field, neither in the egg state nor after birth, and in group B, which had always been kept at rest.

It is not possible to draw from these observations a categorical conclusion; but the impression which we entertain is that the magnetic field has no appreciable influence on the development of silkworms.

d. Action of the magnetic field on the conditions of life and of movement in individuals observed during the time in which the magnetic field acted on them.

Upon a large mulberry leaf on a convenient card, 2 larvæ were subjected to the action of the radiator, at a distance of 10 cm. from the active pole, the polar axis being perpendicular to the card. Intensity of the current, 26 amperes, duration of application *ad libitum* since the observation of the animals went on during the action of the magnetic field itself.

At the first observation we noted that under the action of the magnetic field, the pair of larvæ began, after 2 or 3 minutes, to cease moving, to cease gnawing and chewing the edge of the leaf; little by little both stopped entirely, first one, then the other, after 45 or 50 seconds, and remained motionless for about 3 minutes. We stopped the action of the apparatus, and continued to observe the pair of worms which were no longer influenced by the magnetic field. The immobility lasted about 5 minutes, after which the 2 larvæ resumed their habitual movements again. After 4 minutes longer we closed the circuit, causing the electro-magnet to act, and after 4 minutes and 37 seconds one of the 2 larvæ remained motionless, while the other continued its movements of mastication, without showing any change in its ordinary habit. After about three minutes the motionless larvæ resumed its movements while still remaining wholly under the action of the magnetic field.

These first observations induced us to think that the electro-magnetic field did have some influence upon the relaxation and arrest of movements of the larvæ. We, however, repeated and multiplied observations upon the same pair of worms and also on many others chosen for this purpose, by removing them from or bringing them near the active pole; by diminishing or increasing the intensity of the field; by changing in every way the direction of the polar axis, and consequently the lines of force; but we have not observed again the phenomena obtained the first day, that is, the relaxation and immobility of the larvæ under the action of the field, and the return of the movements when we ceased to cause the magnet to act.

Protozoa. In consequence of their well-defined form, and the certain knowledge we possess regarding their biology, it seemed to us opportune to study the direct action of the magnetic field upon some species of protozoa; further, as this experiment would be performed on elementary organisms, the action exercised upon their protoplasm, could, by analogy, be transferred to the constituent elements of organisms more complex.

We chose those protozoa which inhabit the intestines of thermites, so well studied by Grassi. In the Thermes lucifugus live 6 species of protozoa. Two of these belong to the lophomonadines, that is, trichonympha agilis and microsœmia lexamitoides; two to the cereomonadines, that is, monocereomonas termitas and dinenympha gracilis; two to the Pyrsonymphides, that is, pyrsonympha flagillata and clamastigotes elongatus.

In our observations we always di-

rected our attention to trichonympha agilis, of a form almost round, with many long vibratile hairs toward the narrowest part and with others, less rough, upon its globular body. It is the largest species; it measures 130 microns in length and 40 in thickness; it changes its place rapidly by moving its flagellæ in helicoidal movements. For our experiments we procured triconymphs for examination by crushing the intestine of a thermite against a glass object-slide; we spread rapidly upon the glass the paste which issued from it, and placed it under the microscope.

Before the little glass was placed the radiator, having its polar axis parallel to the surface of the glass. We pushed into the microscopic field one of the largest and most lively of the trichonymphs, and studied all their movements, all their evolutions, all the attitudes which they assumed, for some time; 70 to 90 seconds. We noted that this time sufficed to teach us the normal state of the protozoa, for we had already studied it with attention.

Then we caused the current to pass in the electro-magnet, producing suddenly a magnetic field of the intensity of 25 amperes, and observed what modifications occurred in conditions exhibited by the trichonymphs which served for the experiment.

In all our observations, and they were many, we have very often noted that, under the action of the magnetic field, the trichonymph acted more lively, moved more rapidly the vibratile hairs, and its protoplasm assumed different forms. It took a form sometimes more globular, sometimes more elongated; all the other species of protozoans filling the field of the microscope were seized with an undulatory motion, unwonted and whirling. When we arrested the action of the apparatus all the little world agitating under the microscope resumed immediately the tranquil motion which it had at first.

CONCLUSIONS.

We do not think ourselves authorized by the researches explained in this memoir in detail, to draw categorical and definite conclusions, yet it seems to us that we can deduce from our experiments, that the biological action of the variable magnetic fields upon the lower organisms, is not of such a nature as to manifest itself by phenomena susceptible of serious control.

We shall pursue our investigations upon animal organisms more complex and upon man; then, perhaps, we shall be in a position to express an opinion more precise on this subject; now we can affirm only the following facts:

First, variable magnetic fields, even if they are very powerful, do not influence photographic plates and do not manifest in any wise their action upon phosphorescent plates of sulphuret of lime.

Second, the germination and growth of elementary organisms (infusoria) are not modified in a noteworthy manner by the action of the magnetic field.

Third, the incubation and hatching of eggs of frogs and of silk-worms, develop in a normal manner, without exhibiting any influence of the variable magnetic field.

Fourth, we have noted a like absence of indication that magnetic fields exercise any influence on the development of the larvæ of silk-worms, because one observes the same peculiarities, both in those subjected to the action of the magnetic field and in those which remained isolated for control.

Fifth, finally we believe ourselves able to deny that variable magnetic fields have any biological action upon the lower organisms (larvæ of silk-worms, protozoans), for the undulatory movements by which the latter are animated, under the influence of the magnet, ought not to be attributed, in our opinion, to a reaction of a biological nature, produced by an excitation of their protoplasm, but may be impressed mechanically on these

delicate organisms by the vibrations produced in the air by the magnetic waves radiating from the lines of force.

BIBLIOGRAPHY

1. T. C. Maxwell — A dynamical theory of the electro-magnetic field (Roy. Society Proceed. XIII, 1864).
2. Maggiorani Carlo — La magnete e i nervosi (Vallardi, Milano, 1869).
3. Le meme — Saggio d'una storia fisiologica della magnete (Regia accademia dei Lincei, Roma, 1873).
4. Le meme — Influenza del magnetismo sull' novo fecondato nel corso dell' incubazione (La Natura, Vol. III, 1-16 Maggioe, 1-16 Gingno, 1879).
5. Le meme — Influenza del magnetismo sul cervelletto (R. Accademia med. di Roma, 31 Octobre, 1879).
6. Le meme — Influenza del magnetismo Sulla vita animale (Detken, Napoli, 1880).
7. Le meme — Nuovi studi sull' influenza della magnete sulle nova di gallina (R. Acc. dei Lincei, Roma, 1882).
8. T. C. Maxwell — A treatise on electricity and magnetism (Oxford, 1881).
9. Lo Pinto — Teoria dei principali fenomeni di Elettricita e Magnetismo (Benevento, 1885).
10. A. Marro — Azione della calamita sui delinquenti (Archivio de Pschiatria, Torrino, 1885).
11. Maggiorani Antonio — Influenza della magnete sul feto gia maturo (Accad. Med. di Roma, Sept., 1885).
12. Magini e Maggiorani A — Studi sperimentale sul magnetismo del sangue (Bull. Accad. Med. di Roma, anno XII N. S., 1886).
13. Cesare Lombrose — Studi sull' ipnotismo (Rocco-Torino, 1887).
14. C. Lombrose e L. Ottolenghi — Nuovi studi sull' ipnotismo e sulla credulita (Unione Tipogr. Editrice, Torino, 1889).
15. L. Hermann — Hat das magnetische feld directe physiolokische Wirkungen (March f., s, Gesam. Phys. etc., 1888).
16. G. P. Grinaldi — La Teoria electromagentico del Maxwell e le esperienze di Hertz (Roma, 1889).
17. Braham — Influence des ondes electro-magnetiques sur les plaques photographiques (Phot. News. 1889, p. 620).
18. Graf — Plaques photographiques et electro-aimant (Phot. Cronik, 1889, p. 82).
19. Lindsay E. Warley — Etudes sur l'electro-aimant (Congresso internasionale di fisica, 1900).
20. H. DuBois — Action de l'aimant sur les protozoaires (Congr. Intern. di fisica, 1900).
21. H. Bircher — Ueber Elektromagnetische Therapie (Korrespondenzblatt f. Schwerz. Aerzte, March, 1900).
22. T. Kunitzky — Die permere Therapeutische Onvendung der Elektricitat (Deutsche, Praxis, No. 5, 1900).
23. T. Kunitzky — Untersuchungen ueber die Winkungen der permea-elektricitat (Aerztlich Rundschau, 1901, No. 50).
24. P. Tschensky — Ueber die Wirkung des Wechscheiden elektromagnetischen feldes auf den organismus (Nachr. d. Kais. Milit. Med. Atlas, St. Petersburg, March, 1901).
25. A. Righi — Sui campi elektromagnetici e su quelli creati da cariche elettriche a da poli in moriments (Roma, 1901).
26. P. Rodari — Ueber ein neues elektrisches Heilverfahren (Berliner Klin. Wochenschrift, N. 23-24, 1901).
27. Le meme — Einfükrung in ein neues elektrisches Heilverfahren (Zurich. Zannar, 1902).
28. Le meme — Nochmals einige elektrotherapeutische Reflexionen (Correspondenz. bl. f. Schweiger aerzte No. 4, 1902).
29. Le meme — Die physikalischen und physiologisch therapeutischen Einflusse des magnetischen feldes auf den meuschlischen organismus (Correspondenzblatt fur Schweizer aerzte No. 4, 1903).
30. E. H. Müller — Vorrichtung zur elektrotherapeutischen Behandlung (Zeitschrift fur Elektrother., No. 2, 3, 1902).
31. Le meme — Historisch. Tecnischen Notizen über die Entschlug de permea-elektrotherapie (Zeitschr. f. Elektro-Ther. No. 8, 1902).
32. Le meme — Elektromagnetische Therapie (C. R. II Congresso Internas. L'Elegtrologia e Radiologia mediche, Berna, September, 1902).
33. Le meme — Ueber das Prinzip. der permea-elektrotherapie (Zeitschrift f. Elektrother., November, 1902).
34. Le meme — Ueber das neue Verfahren in der Elektromagnetischen Therapie (Zeitschr. f. Elektrother. No. 6, 1903).

35. B. Beer — Ueber auftreten einer subiektiven Lichtempfindung ein magnetischen feldes (Wien. Klin. Wochenschrift No. 4, 1902).

36. B. Beer — Elektromagnetische Therapie (Die Aerztliche Praxis N. 9, 1903).

37. F. Frankenhäuser — Ueber ein Versuch zur Einführung des magneten in die Therapie. (Zeitschrift für Diat. und Physik. Therapie, Heft, April, 1902).

38. P. Ladame — Un nouvean procede de traitement elektromagnetique (Revue medic. de la Suisse Romande N. 6, 1902).

39. P. Eulemburg — Elektromagnetische Therapie (Encyklopadie, 1902).

40. Le meme — Ueber einige neuer elektrotherapeutische Methoden (Therapie der Gegenwart, October, 1902).

41. G. Lilienfeld — Der elektromagnetismus als Heilfactor (Therapie der Gegenwart, September, 1902).

42. Le meme — Zur Behandlung der Trigeminus neuralgie (Deutsch. Mediz. Woschenschr. N. 18, 1903).

43. C. Medea — A proposito di un nuovo metodo d' unpiego del magnete in terapia (Boll. clin. Scient. della Poliambulanzo di Milano, November, 1902).

44. V. Maragliano — Di un nuovo metodo di terrapia fisica-La Terapia elettromagnetico (Gazz. Ospedali e Cliniche, November, 1902).

45. Ch. Fere — La sensibilité á l' aimant (Revue de Medicine, September, 1902).

46. G. Kalische — Ein neues Verfahren in der elektromagnetischen Therapie (Zeitsch. f. Elektrother, 1903).

47. E. Gottschalk — Therapeutische Mittheilungen aus dem Institut fur Elektromagnetische Therapie zu Stuttgart (Zeitschrift. f. Elektrotherapie, 1903).

48. P. Kreft — Zur Tschinas Behandlung (Therap. Monatscheft, June, 1903).

49. Cheneveau e Bohn — Action du champ magnetique sur les organismes inferieurs (Acad. des Sciences, Paris, CXXXVI, page 1579, Juin, 1903).

50. K. Grenet — Action du champ magnetique sur les infusoires (Societé francaise d'electrotherapie, Juillet, 1903).

51. A. Romano — I recenti progressi dei campi elektromagnetico ecc. (Annali di elettricita medica ecc. N. 10, 1903).

52. A von Larbo — Klinische Erfahrungen üeber den therapeutischen wert der elektromagnetischen Behandlung (Deutsche. Mediz. Wochenschr. No. 2, 1903).

53. T. Turkheim — Aus dem Institut für elektromagnetische Therapie zu Hamburg (Mediz. Woche. N. 15, 1903).

54. E. Lindemann — Ueber unmittelbare Einwirkung der Elektromagnetischen Behandlung (Aerztlische Praxis N. 9, 1903).

55. Gutton — Analogie entre les ondes emanant de champs magnetiques et les Rayons N. (C. R. de l'Academie des Sciences, Paris, 1904, CXXXVIII, pp. 268, 352).

LOCOMOTOR ATAXIA SUCCESSFULLY TREATED WITH ULTRA-VIOLET RAYS*

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Das alte stürtzt, es ändert sich die Zeit
Und neues Leben blüht aus den Ruinen.
Wilhelm Tell,
SCHILLER.

THERE is a tendency among practitioners to look upon patients suffering from locomotor ataxia as hopeless. They know of no certain relief for the distressing symptoms presented by the victims of this formidable disease. Nor can they be blamed for discouragement in the face of such apparently hopeless symptoms as the severe pains, inco-ordination, inability to walk and failure of functional activity of bladder and rectum.

A gloomy prognosis is warranted in most cases, since locomotor ataxia is a disease which generally proves fatal and whose treatment demands our most intelligent effort, coupled with the strictest persistence and regimen, which must be maintained with mathematical precision. The diagnosis of a well advanced case of locomotor ataxia can be easily determined by even an intelligent layman. No disease presents such a sadly pathetic sight and is so characteristic in its leading symptoms. It is in the early stages of this disease, when the clinical picture is obscure, that most of us have erred in our diagnosis.

It is to the diagnosis of this so-called pre-ataxic stage that I wish to briefly direct your kind attention. Early diagnosis of any disease is of vast importance, and this is especially true in the condition under consideration.

While our knowledge of the organic lesions underlying the symptoms which comprise the clinical picture of locomotor ataxia and which are, perhaps, as definite and well established as any associated with spinal pathology in the early stages of the disease, these changes are not clearly apparent, but revelations made by competent German and French observers and investigators seem to point to the fact that the rudimentary and primary destructive process occurs in the posterior columns with their roots and ganglia, taking a longitudinal instead of a transverse direction.

To Duchenne belongs great credit for the clearness and precision with which he describes his remarkable investigations of progressive locomotor ataxia. He, in fact, supplied us the basis of our present pathological knowledge of the disease.

It is not incumbent on me to dwell upon the pathological anatomy of a disease with which you are by virtue of

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your special work so familiar, but in order to substantiate some statements that are to follow, I cannot entirely overlook this phase of the subject.

The portion of the spinal cord lying between the posterior nerve-roots, as is well known, is altered in color, consistency, and dimensions. It becomes gray instead of white, hard instead of soft, and reduced in size. The grayish color predominates in the lumbar and lower dorsal regions. The posterior roots themselves are often atrophied and firmer in consistency and darker in color than in health. On making a cross-section of the cord it is found that the gray discoloration extends inward, involving the posterior columns.

Under the microscope we find the connecting elements of the cord are nearly destroyed and their place is usurped by a firm connective tissue made up of wavy bundles, enclosing here and there a few atrophied axis-cylinders. The blood vessels participate in the morbid process; they become sclerotic, their lumen contracted, while the adventitial sheath is hypertrophied and enveloped by a nucleated, fibrilar, connective substance. It is evident that the increase of connective tissue in the posterior columns is the result of actual proliferation.

It is an established fact that the sclerosis of areas of the spinal cord which are affected, is preceded by a stage of granular degeneration, itself due to morbid molecular disturbances of nutritional as well as functional morbid processes to which the spinal cord is subject. The nerve or its cells suffer all degrees of structural degeneration, culminating in actual death, with an associate increase of connective tissue.

Morton, in discussing the pathological changes occurring in diseases of the spinal cord, pertinently states that in an extreme instance, after complete section of the nerve, the internodal nuclei increase in size, their protoplasm increases and becomes granular and compresses the myelin, ultimately separating into small fragments, which are soon absorbed, leaving only the mere sheath of the nerve. Atrophy of the cell or its axis-cylinder and hypertrophy of the imbedding matrix are synchronous events. Nutrition, which is in abeyance in the former, is in a high degree of activity in the latter. There is evidently an interdependence of nutritional life between the two, for, the more rapid the loss of vitality of nerve-elements, the more rapid the adventitial growth of the matrix.

You can readily judge from this short résumé of the pathology of locomotor ataxia that the treatment must consist in restoring the destroyed nerve cell almost as it were from its ashes, stimulating its functional activity, and at the same time diminishing the nutritive activity of the connective tissue.

Electricity, in its diverse modalities, has long been looked upon as the only natural force that traverses the tissues to their innermost depths and excites their irritability, whether protoplasmic, as in the individual cell, or organic, as in the nerve structure.

The electric treatment in locomotor ataxia should, therefore, always be central as well as peripheral.

Centrally, I use the ultra-violet ray. Peripheral treatment, as I exhibit it, consists of static electricity with the Morton wave current or the application of the wooden brush for ten or fifteen minutes daily.

After hearing Dr. Piffard's paper on radio-praxis, read at the Academy of Medicine, March, 1903, suggesting local cataphoric dehæmatization before applying the ultra-violet ray, it appealed to me as a promising remedy in various diseases of the cord and I decided to try it. I have now treated 36 cases of locomotor ataxia, with the following results:

Males 34, females 2, ages range from 24 to 36. Four of these patients have been restored to good health and are

now able to resume their usual avocations. Twelve have been greatly benefited, the power of co-ordination restored, pain abolished and the ability to use the upper and lower limbs without any assistance established. All are able to rise, dress and undress themselves without any help and are sometimes able to perform such delicate operations as fixing neckties or tying their shoes in a stooping position. In eighteen cases the disease is apparently arrested, with hope of further improvement and final restoration of different functions. Two died during treatment, one from lobar pneumonia, the other of erysipelas capiti.

These cases had for years received different forms of treatment, as the Matchkovsky modified Weir Mitchell suspension method, entire and partial body hot air treatment, hydrotherapeutic treatment, as well as the Franklin method. While some improvement had followed from these methods, none of them had made such gratifying progress as since submitting to the ultra-violet ray treatment.

For the purpose of dehæmatization I use the cataphoric electrode (with a round piece of lint) saturated with adrenaline chloride (1-1000). A pad (Fig. 1) with zinc plate is applied to the abdomen, leaving it on for 3-5-10 minutes. I use my static machine for exciting the ultra-violet lamp with the large Leyden jars as condensers. The lamp is connected by its conducting cords to the outer surface of the jars.

The question arises, and I imagine I hear some of you asking, how does the ultra-violet ray cure this intractable and universally considered hopeless case?

Perhaps we do not know, but a word as to its probable action will not be out of place. Little or almost nothing has been written on the physiological effects of the ultra-violet ray on living tissues, and in all my research I failed to find a single article on the physiological effects of the ultra-violet ray on the tissues underlying the skin, probably the reason being that the ultra-violet rays are absorbed by the skin. But since dehæmatization permits the ultra-violet ray traverse the skin, it opens a new field of study for this particular part of the spectrum, where its action was formerly especially invested in superficial diseases of the skin. Freund, in his excellent and elaborate article on phototherapy, goes into the description of the physical properties of the ultra-violet ray, but says not a word on its physiological effect on the tissues.

We do know that the ultra-violet light is of a short wave length and of very high rate of vibration (more than 800 billions per second), and, like other invisible forms of vibration, has its physiological effects on animal tissue, which can only be understood by clinical manifestations.

With this clinical experience of ultra-violet ray in 36 cases of locomotor ataxia, and about 20 other cases of nervous diseases, I still feel myself not competent enough to present to you a positive statement of the influence of ultra-violet ray on the protoplasmic cell. I can only suggest a theory of action, namely, that its powerful stimulating effect induces more activity in the natural healthy cell and diminishes the nutrition of connective tissue, setting up a more active local metabolism.

Another hypothesis, resembling that advanced by Prof. Sajous as to the rationale of the curative action of the Roentgen ray, is equally applicable to the ultra-violet ray, namely, that it induces a local accumulation of heat-energy and a congestive process through which neutrophyle leucocytes are caused to immigrate into the vicinity of the degenerated cellular elements, into normal and healthy cells.

And in this connection I desire to record my conviction that to facilitate this result it is all-important to maintain the

normal alkalinity of the blood and secretions throughout the entire treatment.

While the dispute among chemists and physicians is still in vogue as to whether the ultra-violet ray traverses the dehæmatized tissue, the fact remains that when applied in a proper and cautious manner it exercises a remarkable tonic effect upon all underlying tissues, and acts as a restorative to the different portions of the nerve structure as have been partly destroyed, eventually restoring their function.

The application of the ultra-violet ray to dehæmatized tissue should be made with great care and judgment. In my opinion it is a very powerful remedy and should never be applied to more than two localities at each seance, and their areas should be varied so that every day a different region of the cord is treated. I divide the spine into three regions — cervical, lumbar, and sacral — treating these alternately or in rotation.

One characteristic and almost invariable effect of the treatment with the ultra-violet ray in combination with the electric stimulation of the peripheral nerves and their end-organs, is the improved general nutrition of the patient. They all make a rapid increase in weight and improve in general health.

Complications associated with these reported cases of locomotor ataxia, were as follows:

Eight had secondary and tertiary syphilis.

Three had pulmonary trouble.

Twenty-nine were victims of marked anæmia.

Seven had cardiac lesions.

Two had diabetes.

Thirty-four showed excess of phosphates and uric acid. This excess amounted to 8-14½ grains to the ounce.

The first case treated by me with ultra-violet ray began in March, 1903.

This is the most typical pre-ataxic case have adhered in locomotor ataxia consists of:

(1.) A warm half-bath at night before going to bed, with light massage.

(2.) Ultra-violet rays in sittings of ten to thirty minutes, three times a week.

(3.) Static electricity by means of the Morton wave current or wooden brush, daily, fifteen to twenty minutes.

Case I.

Charles K., 56 years old, merchant.

Saw him first in 1900, in consultation with another physician; diagnosed the case as locomotor ataxia, which diagnosis was ridiculed by another consultant later on. Did not see him again until early part of 1902, when he was brought to the office by a guide. All his symptoms showed him to be a typical case of locomotor ataxia. Treated him until August, 1903, by the X-ray, also using hydrotherapeutics and massage. Improvement, if any, very slight.

August 12, 1903, first application of ultra-violet ray to lumbar region (where the most pain occurs at night). Pain diminished that night and could sleep four hours at a stretch. Raying continued 10 to 20 minutes daily.

September 16, 1903 — is able to use right hand to grasp objects. Right leg shows some responsive reflex. Feels better in general.

February 10, 1904 — comes to the office with a guide and using only one cane, in the right hand. Reads better. Left hand and leg are improving. Receives ultra-violet ray three times a week.

July 15, 1904 — is able to go down to his place of business, but still unable to write a letter. Has been signing checks for the last four months. Coordination now perfect. Pains have entirely disappeared.

Case II.

J. C., builder, June 21, 1902; 39 years of age, well proportioned.

This is the most typical preataxic case I have ever seen; this opinion corrobor-

ated by several of my colleagues who examined the patient.

Five years ago was exposed for seven or eight hours to wet and cold, during a storm, and was unable to procure change of clothing for some hours. The next day was unable to get out of bed owing to pains in the legs and back. Had chancroid twenty years ago, but no constitutional symptoms. Was treated for rheumatism until he applied to me.

Called June 21, 1902, with complaint for rheumatic pain in lumbar region. On examination disclosed lack of co-ordination, but this can be noticed only when having his eyes closed. He can lift either leg steadily into any position, or stretch out his arms and keep them out, or touch his nose with the forefinger of each hand in turn, while he is allowed to see what he is doing, but if his eyes are shut, his limbs at once become uncertain and unsteady in their movements, and comparatively powerless.

Complains of severe stabbing, boring and lightning-like pains in the lower lumbar region, extending to the feet along the outer side of the metatarsal bones of the little toe.

Was treated with static electricity in connection with general medication, with no particular improvement until the end of one month; after sixteen applications, this pain was much relieved, while co-ordination and the eyesight commenced to improve. Functional activity of bladder and bowels begins to be noticed.

February 26, 1904—has had 186 applications of ultra-violet ray. Comes to office with a guide; went down town to his business for a week and was able to attend to same. Co-ordination improved. No pain. Bowels and bladder now controlled.

July 20, 1904—has received 258 applications. Walks along the street without either guide or support. Only by careful examination can I find some tenderness in any part of lumbar region. Other symptoms have almost entirely disappeared. Attends to his business daily for five to six hours. Appetite good. Has gained 19 pounds since February last. Case discharged and considered cured.

Case III.

J. F., 28 years old, U. S.; cutter by occupation.

The interesting feature in this case is the arthropathic condition of the ankles of both legs, more marked in the left and accompanied by a bursa. Eight or nine years ago was exposed to extreme wet and cold for six or eight hours and was unable to get out of bed next morning. Two days after was able to go down to his business. Being a cutter, was forced to stand much on his feet. After a few hours work was brought home in a cab and was "laid up," as he says, for nineteen months, all this time treated for rheumatism. Was sent to Mount Clemens, Mich., and to the Hot Springs, but obtained no material relief. Was then advised to see an orthopedic surgeon, who diagnosed the case rheumatism in combination with flat foot. Advised arch-supporting foot plates. He was from time to time under treatment by several competent physicians in this city, all agreeing in the diagnosis of rheumatism. One orthopedic surgeon was quite frank in stating that he could not make a proper diagnosis, but if permitted to open the joint, he would be able to diagnose the case properly and to treat it accordingly. No specific history. Had gonorrhœa several years ago. One young surgeon was quite insistent as to the necessity of removing the bursa, and patient was therefore recommended to me for this operation. On examination, found an enlarged left ankle joint with synovial sack situated behind the tendo achilles. No pain on pressure, but suffers severe boring, lightning-like pain from the hip down to the heel, so severe that for the purpose of relief has to lift the heel almost

two inches from the ground while walking.

Romberg's symptom absent. Status on right foot better than on the left foot.

Westphal's symptom (knee jerk) entirely absent in the left, while diminished in the right knee.

Boring, lightning-like pain in the left leg; slight pain in the right. Extreme numbness and drawing pain in the left; very little in the right. If we add the Argyle-Robertson symptom in combination with disturbances of micturition and peculiar numbness around the waist, the picture of locomotor ataxia is complete.

According to Virchow, atheromatous changes occurring in tabetic joints, due to a predisposition of the bones to faulty cellular metabolism, resulting from the nervous disease of the cord, are not very rare.

Charcot observed them in 107 cases: in the knees in 78; hip, 31; shoulder, 21; tarsus, 13; elbow, 10, ankle, 9 times.

This inflamed joint symptom misled some very competent practitioners in their efforts to make a correct diagnosis, and possibly led those who have made the right diagnosis to consider the case hopeless. Flat foot was tested by impression method and the X-ray. The radiograph of arch of left foot proves faulty diagnosis of flat foot. (Fig. IV.)

Synovial sack and the whole left ankle (Fig. II) treated with galvanic current, and after one month's treatment the bursa or synovial sack disappeared; the joint diminished in circumference fully 1¼ inches. (Fig. III.)

Ultra-violet ray applied to lumbar region from first day, for ten to fifteen minutes, three times a week; peripheral treatment with static electricity daily.

March, 1904 — has now received six months' treatment. Joint perfectly normal; has discarded the instep support. Has no pain; stands on his feet seven or eight hours a day. Co-ordination restored. Argyle-Robertson symptom still persists. Knee reflex now present. Is perfect in the right, but still diminished in the left leg.

July 20, 1904 — has no pain. All symptoms of locomotor ataxia gradually disappearing. Works steadily seven to eight hours a day, standing on his feet.

Case IV.

Mrs. A. L., 42 years, unmarried, lady of leisure, corpulent; weight 156 pounds.

Brought to the office July 16, 1903, in an invalid chair. Complained of severe pain in the lumbar region, hips, extending down the legs below the patella. Attributes this condition to a fall in the cellar that occurred four years ago. Nine years ago was laid up in bed for four weeks with rheumatism, due to severe exposure to cold and wet while driving in the Catskill Mountains. Menstruation irregular and painful. Specific history with constitutional symptoms, dating back twelve years.

Examination: Marked anæsthesia below the waist and down to the legs, also in the upper limbs. All important symptoms of locomotor ataxia, as Argyle-Robertson, Romberg, and Westphal symptoms, distinctly present. Treatment began at once.

Ultra-violet ray applied alternately with the X-ray to the lumbar and cervical regions; peripheral treatment with static electricity daily.

In this case attention was paid to reduction of superfluous adipose tissues through muscular exercise in the limbs, with massage and gymnastics. After one month's treatment patient lost 12 pounds, and is able to walk two or three blocks.

February 13, 1904 — Pains in the limb once in a great while; reflex in the knee reappearing. Argyle-Robertson pupil persists. Inco-ordination diminished.

July 20, 1904 — This patient has received 146 ultra-violet ray applications. Came to the office from her

FIGURE I.

FIGURE II.

FIGURE III.

Illustrating — Locomotor Ataxia Successfully Treated with Ultra-Violet Rays. — *Liebermann.*

FIGURE IV.

Illustrating — Locomotor Ataxia Successfully Treated with Ultra-Violet Rays. — *Liebermann.*

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home, a distance of 14 blocks. Is able to use her hands to dress herself. Romberg's symptom much less apparent. Has perfect control of bladder and rectum. Has no pain.

In an overwhelming majority of these cases the disease manifests itself in the lumbar and sacral region, being thus limited for a long period, then advancing slowly upwards. The peculiar tired feeling occurring mostly in the knees and ankles, and which is not relieved by rest, is present in all the cases in combination with the lightning-like pains of such severity that usually the patient is forced to cry out. (At this point it is for the physician to differentiate between the tabetic and rheumatic pains.) Tabetic pains are paroxysmal and the intermissions are complete; tabetic pains are neither aggravated by motion nor relieved by rest, while rheumatic pain is. Tabetic pain is usually relieved by pressure, while rheumatic pain is thus aggravated. Hyperæthesia is usually present with tabetics, and almost always absent with rheumatics. The patient's description of the tabetic pain, comparing it to tearing, boring, and the jumping of a violent toothache, is of great significance. That peculiar form of illusive sensation known as the "girdle constriction" is found in various situations, according to the level of the diseased part of the cord, whether it be a low or a high one.

The following are helpful guides in the diagnosis:

Romberg's Symptom — Swaying of the body and inability to maintain erect position with eyes closed — always present.

Argyle-Robertson Symptom — Loss of pupil reflex to light, but reaction to accommodation retained.

Westphal's Symptom — Absence of patellar reflex, if carefully tested, can always be found.

Another and a very important symptom to assist in the diagnosis of locomotor ataxia in its earliest stages is Frankel's hypotonia.

A few words as to its etiology. Excluding all predisposing nervous and specific causes (syphilis being no more prolific in causing this than any other exhaustive disease, or than excessive venery), I am quite disposed to consider severe and sudden exposure to cold and wet as a prominent etiological factor. Feinberg has demonstrated that cold applied to the cord of animals may produce myelitis.

If excess of venery was as frequently a cause as is generally and confidently asserted in our text-books, our large cities would be literally overrun with atactics. On the other hand, our male population would indeed be in a very deplorable state if masturbation and venereal excesses would produce locomotor ataxia.

In conclusion it may be set down that not all, but some, cases of locomotor ataxia readily respond to a judicious and persistent application of the ultra-violet ray, while others are decidedly obdurate and will try our skill to the utmost. The success thus far attained warrants us in holding out hope in all cases not too inveterate or too complicated. And if in the incurable cases we can succeed in relieving or at least greatly mitigating the severe pains, in partially or wholly restoring the power of co-ordination and overcoming the ocular disturbance, we shall win the unmeasured gratitude of our suffering patients, and the supreme satisfaction of self-absolution and self-approval.

But let no one who intends to utilize this particular modality of electricity flatter himself that he can succeed except by exercising eternal vigilance as to the thoroughness of his methods, the scientific perfection of his technique and the constant exercise of his professional discretion learned from the most painstaking clinical observation. If inclined to fall into haphazard methods which have heretofore been only too common, it were far better that he should never attempt the treatment.

If this brief and by no means exhaustive paper shall be the means of stimulating further investigation and of arousing some reasonable hope in many cases where hitherto there has been no hope, the author's highest ambition will have been realized.

BIBLIOGRAPHY.

W. J. Morton, M.D., "Diseases of the Spinal Cord," International System of Electro-Therapeutics, edited by Horatio Biglow, M.D., 1901.

H. G. Piffard, M.D., "Radio-Praxis," New York, 1903.

Dr. Leopold Freund, "Elements of General Radio-Therapy," New York, 1904.

Dr. Arthur Von Sarco, "Der Achillessenenreflex und Seine Klinishe Bedeutung," Berlin, 1903.

Dr. H. S. Frenkul, "Die Behandlung der Tabishen Ataxic mit hilfe der Uebung," Leipzig, 1900.

EDITORIAL

THE RATIONALE OF ELECTROTHERAPY

THE great majority of our remedies were used empirically long before a scientific explanation of the manner of their action was arrived at, and of many of our most valuable curatives we are still far from being able to satisfactorily explain how they exert their healing power. Electricity is no exception: its history teaches us that the different electric modalities were, one after the other and without sufficient logical reason, introduced into our therapeutical armamentarium, and again, without sufficient cause, relegated into oblivion, only to be revived in a similar way.

It is the physician's main endeavor to cure, and he will not reject a remedy for the mere reason that its action is not understood by him. But he will make efforts to unriddle the unknown and mysterious, because the search for truth and clearness must be one of his inherent qualities; because, when possessed of incontrovertible facts, he will have a safer basis for his actions, and new viewpoints and new healing possibilities will open before his eyes.

The course taken so far in getting at the truth in electrotherapy is undoubtedly the right one. First and above all a knowledge of the physical properties of electricity was necessary. The electrotherapeutist must know on what principle is built the apparatus employed by him, and of what nature is the current he may expect from a certain battery or arrangement; how the current is to be regulated, how the current strength increased or decreased, resistance cut out or in, how a shunt will affect a current, etc.

The physiological researches on the exposed and isolated nerve and muscle, which date back to more than one hundred years and have kept many gifted inquirers busy during the past century, were commenced by means of the galvanic current, the frictional electricity after a period of glorification having been pressed into the background. Later on, after the ingenious discovery of the induced current by Faraday, this current was also made use of in this research work, and as a result of lengthy and painstaking labors a thorough insight was gained into the changes which animal tissues undergo under the influence of various electric currents.

When it was attempted to apply the results of these observations to the influencing of these same tissues *in situ,* under the unbroken skin, however, difficulties had to be reckoned with that were not present before. The skin offers such a considerable resistance to the current flow that the resistance of the other organs is comparatively small and may be entirely neglected. But this resistance shows fluctuations not only in different individuals but also in the same person in different parts of the body and according to the duration of application, the resistance becoming smaller after a short time of current flow. The diminished resistance may be attributed partly to the physicochemical, partly to the physiological effects of the current. Fluid is conveyed from the positive to the negative pole, and thus the epidermis under both electrodes is moistened and becomes a better conductor (phoresis). The physiological effects are dilatation of the blood vessels, increased secretion and, in consequence, increased heat and increased moisture of the tissues in the surrounding area.

The resistance of the skin can be overcome by the addition of electric cells (in series) in the circuit, but now another question confronts us: how the current, when percutaneously applied, is distributed through the body, and whether and to what degree the several tissues come under its influence. "There can be no doubt," says Rossbach (Lehrbuch der Physikalischen Heilmethoden), "that an exposed, denuded, human nerve would show the same phenomena of electrotonus as the frog nerve, and that on the uninjured man — that is, on the unbroken skin — contradictory facts are found only because the tissues above the nerve, and the way of applying the electrodes, create so many incalculable complications which the experimenting physiologist can avoid." And the experiments and observations have proved, what would be supposed *a priori,* that the electrical current in the body is distributed only after physical laws, and that in the application of currents of a strength employed for therapeutic purposes, measurable branch currents can be conducted through the brain, the spinal column, the sympathicus, the bulbi, the auditory nerve, the tongue, the organs of the thoracic and abdominal cavities, etc.

Just how much of the current-strength will enter into these organs cannot be ascertained in every case, but according to the law of derived currents the current which represents the shortest distance between the anode and the cathode — if, as is the case here, every tissue unit offers the same resistance — has the greatest strength. Or, using Filehne's (Deutsches Archiv. für Klin. Medicin., 1870) expression, we may say: "the current has the greatest density right in the middle of the parts covered by the electrodes, and we may infer that in the path of its greatest density the current exerts its main effects."

All these experiments refer in the first place to the galvanic current, but are in the main also applicable to the faradic. But there is a difference of opinion as to how deeper tissues are affected. Mann, for instance (Elektrodiagnostik and Elektrotherapie, 1904), says that in electrotherapeutics of the brain the faradic current is of no value, as it does not sufficiently penetrate to have any influence upon the interior of the skull; also the Franklinic headbreeze is said by the same author to have no direct influence on the brain, but to exercise the favorable effect of a derivative skin irritation only. D'Arsonval (Ann. d'Electrobiologie, Vol. 1) is of the opinion that the high frequency currents are nothing but a surface charge, while Freund (Gundriss der Gesammten Radiotherapie) ascribes to them a deeper effect, dependent as to degree on the current intensity.

The principal question arising is: what influence have the physiological facts upon electrotherapy? How do they exert their weight in determining the selection of the proper current and the proper method of application in the treatment of different affections? There is no satisfactory answer.

As little as we know what electricity really is, just as little are we acquainted with the manner in which electricity cures diseases. "The methodical application of electricity in medicine," says Lewandowski (Elektrodiagnostik und Elektrotherapie, 1887), cannot be based on any one of the theories mentioned, but the methods of producing the effects which are indicated in each case rest on facts empirically gained."

The physiological observations, nevertheless, give many a hint and enlighten considerably the obscure path of a crude empiricism. The differential therapeutic application of anode and cathode no doubt is to a great extent a consequence of the scientific physiological pioneer work, while the labile, the stabile, the intermittent galvanization and the voltaic alternative owe their manner of application chiefly to medical experience.

The anode in general reduces the irritability, has a sedative action; the cathode, on the contrary, increases the irritability, has a refreshing, stimulating action; but every electrotherapeutist is acquainted with cases in

which the positive pole failed to relieve pain, while the negative did the work expected from the positive pole. We must not, however, from this draw the conclusion that the action of electricity is capricious and unreliable, but rather lay the blame to our ignorance of the pathological changes underlying the pain in the given case.

Between the galvanic and the faradic current there is in truth only this difference: that the faradic may be considered a regularly interrupted galvanic current with higher tension and smaller volume. This, for instance, is shown in the reaction of degeneration: here the galvanic irritability of the muscle is maintained and the faradic lost, but the rapidly interrupted galvanic acts like a faradic current and does not cause muscular contraction. On account of the short duration of the single impulses and the smaller amperage the faradic current, at least in the strength employed in medicine, cannot develop electrolytic or phoretic effects. According to the greater or smaller number of interruptions the effect of the induced current will vary; beyond a certain limit the muscular fibre has not sufficient time to relax and will remain in a state of tetanic contraction.

To give a summary of the therapeutic uses of the various currents, general rules will not do, but it would be necessary to take every disease and quote the methods which have been found valuable in treating it. But this would exceed the boundaries of these general remarks. The expert will pretty soon come to a decision as to the selection of the indicated current and current-strength, but will often have to change the method in case of failure. The beginner will have to study and to profit by the experiences laid down in the electrotherapeutic literature in order to get the best results.

Thus we may say that here we stand before a perceptible gap, of course less perceptible in practice than from a purely scientific standpoint. But, as mentioned above, the value of electrotherapy remains the same even under these circumstances, and it is to be hoped that, in the course of time, electrotherapeutic indications can be formulated with more certainty as a happy sequel to future scientific investigations.

A CORRECTION

In THE ARCHIVES for August, page 102, first column, last line of the abstract of Dr. P. A. Aurness' article, "The Application of Ice in Lobar Pneumonia," there occurs the phrase, "There is danger, he claims," etc. It should read "There is *no* danger, he claims," and we hereby tender our apologies to Dr. Aurness for our inadvertent distortion of his statement.

JOURNAL OF ADVANCED THERAPEUTICS

New York, N. Y., August, 1905.

1. The Radiant Light Bath in Arterio-Sclerosis. — T. D. Crothers.
2. The Static Wave-Current and X-Ray in Diseases of the Stomach. — M. F. Setters.
3. The Drugless Treatment and Cure of Constipation. — Otto Juettner.
4. Report of the Committee on Current Classification and Nomenclature. (*To be continued.*)
5. The Schott Method of Treating Diseases of the Heart and Blood Vessels. — James M. Anders.
6. The Physics of High Frequency Currents with Special Reference to Their Use in Therapeutics. (*To be continued.*) — Earle L. Ovington.

1. Crothers' apparatus consists of a small room lined with tin and strung over with 100 incandescent lights of 32 candle-power, the patient remaining therein for from 5 to 10 minutes. He considers the beneficial influence to be principally due to the light, as the heat of the room rarely exceeds 115° F. This influence is particularly apparent by a marked sedative effect exerted upon the irritable nervous system.

Arterio-sclerosis is a condition accompanied by deposits in the walls of the arteries and loss of contractile power whereby the circulation of the blood and osmosis are interfered with. The condition usually results from excessive nerve strain, faulty living, and senile change. The therapeutical indications, therefore, would be stimulation of nutrition and visceral function.

Two cases are reported of men who had gotten into a condition of excessive nerve debility which had reached the stage of mental aberration and was accompanied by marked evidence of sclerosis, excessively rapid and irregular heart action, etc., which he subjected to this treatment combined with general mechanical vibratory stimulation and the static breeze; in both cases the relief of the conditions was marked and rapid. Crothers then suspended the light treatments, keeping up the vibratory and static applications, whereupon the symptoms reappeared. They disappeared again when the light applications were resumed, and did not reappear when the static and vibratory applications were discontinued, the light treatments being persisted in. This is considered to be evidence that the beneficial effects were due exclusively to the electric light baths. Both patients recovered entirely under their continued use.

Crothers considers that this therapeutical modality "seems by its mild effects to be more impressive than the arc light, used for the same purpose," and states that further observations along this line have given him a new confidence that some particular force from this source is imparted to the body, antagonizing diseased action and restoring functional activities.

2. Setters reports three cases of gastric disorder in which the patient recovered under short applications of the X-ray, followed by from 10 to 20 minutes of the static wave current with the electrode placed directly over the stomach.

The first case occurred in a man 45 years of age, was diagnosticated as gastric ulcer, was characterized by severe pain and hemorrhages. He had lost 30 pounds in six weeks. Patient recovered practically in two months, but the technique and frequency of application were not stated.

The second case occurred in a man 40 years of age, was one of painful dyspepsia accompanied by loss of weight. His recovery is reported, but not the length of time required or the technique of the applications.

The third case was one of severe pain in the stomach accompanied by vomiting, stomach being two inches below the umbilicus according to examination by the gastro-diaphane, and complete lack of motility. Also impaired digestive functions. This patient improved greatly under the applications, but the time required and the technique used are not stated.

3. Aside from purely extraneous and mechanical causes such as plumbism, habitual use of opiates, malformations of the intestinal canal, strictures, etc., constipation may be caused by adhesions involving the serous coat of the intestines, neurotic conditions, metabolic disorders, and trophic factors due to faulty diet. Recognition of the causes of dyspepsia is the first and a very important step in its treatment.

Suggestion is frequently an effective curative agent as illustrated by the gratifying effects which sometimes follow directing the patient to go to the closet every day at a certain time.

The regulation of diet is a very important element, and the drinking of several glasses of fresh water immediately after rising in the morning is sometimes most efficient. In some cases hot water with a little table salt added answers better than clear water. After this the patient should walk briskly in the open air for half an hour and then eat his breakfast. Breakfast should be followed by another period of exercise, when the patient should be directed to attempt defecation. Fruit, cereals, rye bread, and vegetables such as peas, beans, cabbage, etc., should form an important element of the diet, and fresh water may be advantageously given between meals except in cases of well-marked gastric dilatation.

Irrigation of the colon is of value and should be practiced two or three times a week before retiring, injection to consist of a quart or more of warm water taken in the knee-chest position. Patient should then lie on his back and gentle massage applied over the course of the ascending, transverse, and descending colons.

Deep massage of the abdomen is also useful and should be applied over the ascending, transverse, and descending colons, but superficial manipulations are worthless and sometimes irritate the subcutaneous tissues. The abdominal bandage is recommended in cases characterized by gastric or intestinal dilatation.

Exercise, both active and passive, such as walking, horseback riding, and Swedish movements are of great value. Lying on the back and then slowly rising to a sitting posture with arms folded, 25 times morning and evening, and having the patient stand and then slowly bend over until his fingers touch the toes are good varieties of exercise.

For vigorous persons the douche on the abdomen in the morning, or the alternating hot and cold douche on the abdomen is very useful; in persons whose circulation is sluggish the douche should be warm or hot. An induced current applied to the anterior abdominal wall by means of sponge electrodes constantly shifted about is well spoken of, also this modality combined with abdominal massage. The constant current, positive pole in the rectum, negative through a flat electrode on the abdomen, rapidly interrupted, is sometimes most effective. The negative static spray applied to the abdomen, sparks to the spine and abdomen or the wave current applied to the abdomen with as long a spark-gap as the patient can endure, are also sometimes of very positive value.

Mechanical vibratory stimulation, made peripherally by deep and coarse vibration over the abdomen, combined with deep, rapid vibration of the lower dorsal and upper lumbar posterior nerve roots for 15 minutes, sometimes produces brilliant effects.

Juettner thinks that the best and promptest results can be expected in con-

stipation by the use of massage, the interrupted current, the constant current, and vibratory stimulation, with dietetic regulation in all cases.

4. See THE ARCHIVES for June, 1905.

5. Anders considers that the beneficial influence of the Nauheim baths should be ascribed as much to the "resistance exercises" which accompany them as to the water itself, perhaps more. The water differs from other waters in so far as that it contains more carbon dioxide in solution. The direct results of the bath are a more vigorous systole with diminution of the size of the dilated heart and reduction of the pulse rate, arterio-dilatation whereby circulation in the heart becomes freer, and irritation of the cutaneous sensory nerve filaments. The effect upon the nervous system is very important, hence orderly method and sound judgment are required to decide whether or not the Schott methods should be used.

The "resistance exercises" are for the purpose of bringing into activity groups of muscles which are ordinarily more or less inactive, the stimulation of peripheral nerves, while the baths act on the sensory nerves. The general plan governing these movements is as follows:

"1. Each movement is to be performed slowly and evenly, that is, at a uniform rate. 2. No movement is to be repeated twice in succession in the same limb or group of muscles. 3. Each single or combined movement is to be followed by an interval of rest. 4. The movements are not to be allowed to accelerate the patient's breathing, and the operator must watch the face for the slightest indications of (*a*) dilatation of the alæ nasi, (*b*) drawing of the corners of the mouth, (*c*) duskiness or pallor of the cheeks and lips, (*d*) yawning, (*e*) sweating, and (*f*) palpitation. 5. The appearance of either of the above signs of distress should be the signal for immediately interrupting the movement in process of execution, and for either supporting the limb which is being moved, or allowing it to subside into a state of rest. 6. The patient must be directed to breathe regularly and uninterruptedly, and should he find any difficulty in doing so, he must be instructed to continue counting in a whisper, during the progress of each movement. 7. No limb or portion of the body of the patient is to be so constricted as to compress the vessels and check the flow of blood."

The fact that many cases of angina pectoris yield to the Schott methods would indicate that this grave trouble is sometimes dependent upon abnormal vaso-motor conditions. These methods seem to be especially serviceable in the advanced stages of rapidly developed dilatation. It, of course, does not cure chronic valvulitis, but it restores disturbed compensation. This stimulation exercises a salutary influence on the heart action, the respirations, and the systemic circulation of the blood, promoting the warmth of the body and regulating the tissue metabolism. It is sometimes necessary for the patient to resume the baths from year to year in order to keep up the compensatory equilibrium. After the course of baths it is very important to send the patient to an altitude of from 1,000 to 3,000 feet and keep him rigidly isolated from professional and domestic cares, having him live in the open air and sunshine. With special reference to altitude the individual patient's condition of course must be carefully considered. Cases of arterio-sclerosis have also recovered completely under the use of the Schott methods.

Contra-indications mentioned are:

"1. Cases presenting fever. 2. Advanced arterio-sclerosis. 3. Far advanced myocarditis. 4. The closing stage of chronic valvulitis, with extreme dilatation of the chambers. 5. Aneurisms of the aorta or of its larger trunks, except in the incipient stage. 6. Cases in which chronic bronchitis and asthma

are well marked (Baldwin)."

6. This article will be abstracted when it is concluded.

ARCHIVES OF THE ROENTGEN RAY

August, 1905.

1. The Treatment of Ring-Worm of the Scalp by X-Rays. — Geo. B. Batten.
2. The Diagnosis of Thoracic Aneurism by means of the Roentgen Rays. — G. Harrison Orton.
3. Colitis and High-Frequency Currents. — Edward W. H. Shenton.
4. Action of the X-Rays on the Platinocyanides, Especially on Those of Barium. — H. Bordier and J. Galimard.
5. On Osseous Formation in Muscles Due to Injury (Traumatic Myositis Ossificans. — Rob't Jones and David Morgan. (*Continued.*)
6. Further Observations of the Unipolar X-Ray. — Samuel Stern.

1. Batten says that the difficulty in the treatment of ring-worm of the scalp and other hairy parts is due to the presence of the fungus in the hair roots where drugs will not penetrate. By the use of the X-ray, however, the hair falls out from the bottom of the follicles, thus making the treatment as easy as in other parts of the body. His method is to mark carefully, every patch of ring-worm, then taking a boy's cap he covers it with a thick layer of white lead, covering this layer with linen; he then cuts holes in the cap over each of the patches of ring-worm. He exposes the scalp thus protected to the ray from a medium hard tube, not longer than 10 minutes, every other day, for six exposures, at a tube distance of six to eight inches, care being taken that the ears, neck, and face are well protected from the ray, either by a shield or by a diaphragm over the tube. During the treatment the scalp is bathed night and morning with a lotion of resorcin 1 per cent.; ether, meth. 25 per cent.; Spt. Vini Meth. 74 per cent. In about 17 days to 4 weeks the hair over the patches falls out and when this is complete and there is no irritation of the scalp, a mild parasiticide ointment is rubbed in daily, continuing also the use of the lotion. The hair begins to grow in 7 or 8 weeks from the commencement of treatment and the growth is complete at the end of three or four months.

He believes that the X-ray has no destructive action on the fungus, but produces its effect by opening a way for the lotion. He has never seen any reinfection of new or old hair after this treatment, and believes that in the near future children will be able to go back to school within a month of beginning treatment.

The new hair, as illustrated by several cases, seems to grow more strongly than the old. The method causes no pain or discomfort. He prefers the slower method of several exposures to that of the French operators, who expose but once and must therefore take precautions to obtain an actual measurement of the amount of radiation during a single exposure.

He undertakes to cure a patch of ring-worm of the scalp in one month and to have the hair grown fully in three or four months. These cases should be treated only by those skilled in X-ray work, and need to be seen but seven times, once for examination, six times for the exposures, after which the case is returned to the ordinary medical attendant. He believes that by the method of Sabouraud and the use of his radiometer it is possible to obtain a complete depilation without a dermatitis, following a single exposure.

2. Orton believes the X-rays a very valuable means of diagnosis in thoracic aneurism, that by their aid the diagnosis is easily made and mistakes in the hands of competent observers are extremely rare. The method in England is to make the examination with a screen

placed anteriorly or posteriorly, but in this position the shadow of the aorta is almost obscured by the median opacity composed of the shadows of the sternum and vertebræ, except a small shadow on the left cast by the commencement of the descending aorta, known as the left lateral aortic bulge. This is often absent in children and young adults. This method of examination is practicable in many cases of aneurism of considerable size, the aortic shadow being increased on one or both sides of the sternal shadow. Aneurism of the descending arch usually casts a shadow to the left of the sternum nearer the back of the chest; that of the ascending arch to the right and nearer the front. A large aneurism may cast a shadow both to the right and left of the median opacity, and in many cases these shadows can be observed to pulsate when examined with a screen.

Another important sign in the diagnosis of aneurism, first pointed out by Walsham, consists in a change in the position of the heart which comes to lie more transversely, the right side apparently pushed down by the aneurism and the apex raised. In the majority of cases this feature is well marked, and Orton has come to look upon the transverse position of the heart as a very valuable and constant sign. In many cases of small aneurism, the anterior or posterior examination is not sufficient and the oblique method, as used on the continent, should be employed. This method has been well described by Holzknecht and Beclere. It consists in rotating the patient so that the rays penetrate the chest obliquely. If the screen be placed on the left of the patient and the tube on the right side, the pericardial shadow is bounded by two clear spaces, the retrosternal in front and the retrocardiac behind. In this position the inferior parts of the ascending and descending aorta can be seen, but the arch is hidden by the shadow of the shoulder muscles and vertebræl column.

Now if the patient be rotated so that the rays penetrate the chest at an angle of 45 degrees forward and from left to right, the best position is obtained. In this position the cardiac shadow is angular; the base continuous with the diaphragm, the superior angle prolonged into a vertical offshoot, caused by the superimposed shadows of the ascending and descending parts of the arch. In this position many cases of supposed aneurism which show the marked aortic bulge in the antero-posterior examination are shown to be not true aneurism. In suspected cases the examination is not complete until this method has been employed.

3. Shenton calls attention to the value of the high-frequency currents in the treatment of colitis, both mucous and ulcerative. He reports a case of a year's standing with chronic diarrhœa, having as many as eight discharges each night, passing blood and mucous. X-ray exposure to the abdomen daily for a month produced no effect. A few applications of high frequency given on the condenser couch, followed by 15-minute local applications showed a marked change in the patient, but not in the colitis. A prolonged course of treatment, however, produced a slow progressive improvement in appetite and sleep with less diarrhœa, blood, and pain. In about nine months the patient was completely cured, is leading an active life and has had no return of the symptoms. In eight other cases, four ulcerative and four mucous, one ulcerative was cured; in one the symptoms were markedly relieved; in one no improvement followed, and in one slight relief was obtained. Of the mucous cases three were completely cured, one greatly improved. While the results have been very encouraging, yet only those cases have been reported, in which time has shown a permanent cure.

4. See THE ARCHIVES for July,

1905, page 26.

5. Jones and Morgan continue their tabulation of cases of traumatic myositis ossificans.

6. Stern describes a unipolar X-ray tube constructed somewhat like a high-frequency vacuum electrode, having a cathode with an outside terminal entering the tube at one extremity, and a small plate of metal acting as an anti-cathode set in the other extremity, but not provided with an outer terminal. The tube is adapted for the application of the X-ray in the various forms of skin disease and to lesions situated in various cavities of the body. The plate must be so placed that the entire cathode stream strikes it and far enough away so as not to heat readily; this distance is usually from one to two and one-fourth inches. The current for operation is derived from one pole of the Oudin resonator or one of the forms of high-frequency apparatus. It is unsatisfactory when used on static machines. It works best when brought in contact with the body, thus grounding the free extremity. It has decided polarity which must be determined by test. The vacuum of the tube must be kept high in order to minimize surface discharges. The amount of current passing through the tube must be regulated entirely by the spark gap of the high-frequency apparatus, which should be opened just enough to give a good ray. If the tube is of low vacuum and heats rapidly, a wet gauze compress should be placed between the tube and the part under treatment. The ray has a high penetration, reading as high as 6 on Benoist's radiochromometer. The therapeutic effects of the ray are in all respects equal to those produced by the ordinary form of tube. Cavities may be treated with ease that are practically inaccessible with the ordinary tube. It does away with protecting shields, is safer for the operator, the results are much more quickly obtained, and the length of exposure should not exceed more than 2 or 3 minutes.

At the Mt. Sinai Hospital and in private practice more than 30 cases of chronic eczema, psoriasis, lichen planus, pruritus, lupus vulgarus, etc., have been treated with this tube, and the results obtained much more rapidly than with ordinary forms of tube.

ARCHIVES D'ELECTRICITE MEDICALE

Bordeaux, France, July 25, 1905.

1. The Power of an X-Ray Tube under Different Methods of Excitation. — Dr. Turchini.
2. The Notation of the Results of an Electrical Examination of Muscles and Nerves. — Dr. H. Marques.
3. Congress of Physiotherapy. Report upon Instrumentation and Technique. — Dr. J. Belot.
4. Roentgen Congress. Exhibit of Instruments. (*Concluded.*)

1. Turchini says it is evident that the illumination of a fluorescent screen or the chemical effect upon a photographic is greater as the quantity of rays emitted or as the current traversing the tube is greater. (The latter may sometimes be the case, but only under certain conditions and within certain limits. — Ed.) He has satisfied himself that if a tube has the same spark equivalent the degree of penetration shown by the radiochromometer is always the same no matter what may be the intensity of the current or what kind of coil and interrupter are employed. The degree of penetration is independent of the degree of vacuum and depends only on the spark equivalent, since with the same degree of vacuum the spark equivalent may vary from 3 to 10 cm. (one to three and a third inches) according to the mode of excitation. Comparing the light upon the area with that of standard electric light he has found that the light in-

creases with the spark equivalent up to 10 or 12 cm. Above that the amount of radiance is not affected by the increasing spark equivalent, but varies according to the strength of the current. The result was obtained by exposing a photographic plate under varying conditions. There is a general impression that rays from a hard tube produce little effect upon a photographic plate. He says there is nothing in this; the plate is affected all right, but there is not a very good picture because the hard rays are so penetrating that the different tissues traversed cast very little shadow. Soft rays unequally absorbed by the tissues of different densities give the best pictures, but of course take a longer time. His conclusions are that for fluoroscopy the most powerful coil and the softest rays shall be used. In any case it is not necessary to have more than a 12-centimeter spark equivalent.

2. The electrical excitability would be a very simple matter to record if it simply concerned the faradic current. The distance in centimeters of the primary from the secondary coil which caused a minimal contraction would be sufficient. But a number of details are necessary in regard to the galvanic examination; strength of current, active pole, opening or closure of current, relative magnitude of contractions. One of the present systems, the German, expresses the normal appearance and magnitude of muscular contractions obtained by galvanization of motor nerves as follows, KaSZ>AnSZ> AnCZ>KaOZ. This means cathode closure contraction is greater than anode closure contraction, which is greater than anode opening contraction, which again is greater than cathode opening contraction. One cardinal fault with this system is the fact that in the different languages such differences occur in nomenclature that a formula written as above in German may be unintelligible to a Frenchman or an American. He gives a list of the 25 ways in which KaSZ has been written by different authors (KaSZ, KSZ, NFC, NFS, CaFeS, etc., etc.), also 20 expressions for AnSZ, 10 for AnOZ, and 12 for KaOZ. And the confusion grows when the strength of contraction is indicated in this system per ex. KaSZ, KaSz′, KaSZ″, KaSZ‴, or again, KaSZ, KaSZZ, KaSZZZ indicates first more and more feeble contraction and second stronger and stronger contraction, KaSZ representing the average contraction.

In this way he takes up and considers the different systems, arriving at the conclusion that it is necessary to state in milliamperes the strength of galvanic current required to excite contraction in the given muscle, and the strength in volts or in distance of the primary from the secondary coil in the case of the faradic current. His report of a case is in the form of a chart, the vertical columns being assigned to the individual muscles and the distance above the horizontal line, marked from zero to 15 centimeters, represents increasing faradic excitability (the greater the distance of the primary from the secondary coil which will produce a contraction the greater the excitability of the nerve). The distance below the horizontal line, marked from 12 ma. to zero, indicates increasing galvanic excitability. A heavy line may represent the curve of the right side and a light line that of the left side. If necessary the cathode or negative closure curve may be designated thus — ●, the anode closure thus + ●; the cathode opening thus — O, and the anode opening + O. But this would make 8 sets of lines counting right and left, and it would be better to divide the chart vertically into two halves for the right and left sides of the body. His chart will answer equally well for those who use a voltmeter instead of a milliamperemeter for the galvanic current and a rheostat determining the number of ohms for the faradic test.

3. There have been two periods in

X-ray therapy. First the empirical period, and second the scientific period characterized by the use of exact measurement of the quantity and quality of the radiance.

Generators. The static machine is excellent, requires no interrupter or ventril tubes, but must be large and expensive, is noisy and subject to atmospheric influences. From 12 to 20 plates are required. A coil gives good results if it has a spark length of 25, 30, 40, or 50 centimeters, and a variable primary winding. There are three types of interrupters: *a,* vibrating, scarcely ever used except on small portable outfits; *b,* mechanical of two forms, one a motor which mechanically makes and breaks an electric contact, and the other an electro-magnet actuating a strip of flexible steel, which is really a vibrating interrupter; *c,* liquid interrupters of the Wehnelt platinum point type or the Caldwell-Simon type called interrupters a trous (interrupters with holes).

The liquid interrupters require no condenser, the mechanical ones do. Its object is to diminish by its charge the extra break current in the primary coil and its spark and by its discharge to demagnetize the soft iron core and by these two means to regulate the production of the secondary current. Still there is a certain amount of inverse discharge from a coil and this may be suppressed by having the poles of the coil provide the positive with a disk and the negative with a point. If these are placed at the proper distance the inverse discharge will pass between them, while the direct discharge must go through the tube. This is very noisy and not as effective as Villard's ventril tube ("soupape") which is a vacuum tube, which, owing to the difference in the size and arrangement of its electrodes offers an impassable resistance to the current in one direction (the make current) and scarcely any resistance to the break current.

Several manufacturers are now making a transformer that works without an interrupter. It is an ordinary step-up transformer on alternating electric light circuit and consists of two spools of wire, a primary and a secondary, wound around different parts of a closed iron ring. It works with great regularity and requires a system of two ventril tubes to suppress the inverse discharge.

Tubes. To be of any service in radiotherapy tubes must be regulated so as to give a high or a low degree of vacuum as required. Tubes which can be both raised and lowered are made by Muller, the Polyphos Co., Hirschmann, Bauer, etc. To lower the vacuum an electric spark is passed through and heats a disk in the interior of the tube which liberates gas. To raise the vacuum the current is made to pass through a little spiral of wire which gives off metallic dust which absorbs particles of gas. Some of these are arranged to be self-regulating, but this perfection is more apparent than real. The other type of regulator, the Osmo regulator of Villard, raises or lowers the vacuum if a platinum tube is heated with a flame and thereby becomes permeable to hydrogen gas.

Belot considers that the best tubes for radiotherapy are those made by Thurnyssen and provided with Villard's osmo-regulator. The anti-cathode of an X-ray tube may be made of pure nickel or irido-platinum, and lately, by Siemens, of tantal, a metal with a higher fusing point than platinum. He does not consider re-enforced anti-cathodes good, but those that are cooled by air (Bauer) or especially by water, are excellent, but not so requisite or convenient for radiotherapy as they are for radiography. Tubes designed to limit the rays to one direction and to suppress secondary rays are made of lead glass except at a certain part, or are made with a conical anti-cathode or a metallic diaphragm, they being cheaper than the special glass ones. Tubes of the regular model with pro-

longations for application in cavities present no advantages over independent specula, etc. For use in cavities the anti-cathode should be at the extremity of the prolongation, and such are now made. For radiotherapy he prefers tubes which have been used some time and have developed a violet deposit on the inner surface of the glass.

Measuring instruments. The spintermeter (Beclere) indicates the resistance of the tube to the passage of the particular current which is being used. Gaiffe's milliamperemeter measures the current passing through the tube. These two furnish only vague indications, however, of the amount of X-radiance produced. With the same apparatus the same operator may be able to duplicate an exposure by reproducing the same spark equivalent and the same milliamperage, but let him take another coil and a different interrupter and these conditions will not give the same result. With a transformer, however, the indications are more precise, and if the tube remains in the same condition the same milliamperage and the same spark equivalent will produce the same amount of X-radiance.

The radiance itself may be directly measured. Benoist's radiochromometer gives the average degree of penetration of the complex radiance from an X-ray tube. Wehnelt's crypto-radiometer is only a modification. Curie's electrometric method is suitable for the laboratory, not for treatment. For measuring the quantity of X-radiance Holzknecht's chromoradiometer is high priced, delicately graduated, hard to obtain, and the new model is not as good as the old. Laboraud and Noire's radiometer employs barium platino cyanide, which is less sensitive and has to be placed midway between the anti-cathode and the surface to be treated. Haret's holder does this nicely, attached to the X-ray tube itself. Freund's apparatus, based on the change in color of a 2 per cent. solution of iodoform in chloroform is too delicate for practical use. Kienbock's quantimeter uses photographic paper. Köhler's idea of placing a thermometer in a depression in the wall of the X-ray tube would only be useful to an operator working under identical conditions. The fluorescence on a screen may be compared with an illumination artificially produced (Contremoulins) or by a radioactive salt (Courtades). He says, "I will not insist upon the electrometric method which consists in measuring the conductivity acquired by the air under the action of the X-ray."

Protective apparatus. Localizers are a sort of opaque box surrounding the tube and limiting the rays to one direction. Sheet lead covered with rubber on both surfaces and cut into different shapes may be placed around the part to be exposed, or rubber sheeting with an admixture of baryta, or a thick paste of bismuth or mercurial plaster. The physician should keep as far away from the tube as possible and behind the plane of the anti-cathode. Albers-Schoenberg's sentry box is not much used in France, nor are the X-ray proof clothes. However, X-ray proof aprons are indispensable for the protection of the genital organs, or a large screen of lead glass will do. Protective gloves are not very convenient, those of lead are better than those of rubber and baryta. Large spectacles of thick lead glass will protect the eyes.

TECHNIQUE

Secondary factors. Some of these are amperage of the current and its voltage, the power of the transformer, the nature of the interrupter and the number of interruptions, etc., etc. And then it is necessary to consider the age, sex, and previous condition of the patient, whether the tissues are inflamed and whether there has been any previous exposure to the X-ray.

Factors of capital importance; quality and quantity

Quality. Kienbock has demonstrated that the rays only act where they are absorbed. For cutaneous lesions Belot recommends rays No. 5 or 6 Benoist. For subcutaneous or deep lesions Belot uses rays 9 or 10. These being more penetrating there is not the same inequality between the amount absorbed by the skin and by the deep tissues. Thus the deep tissues may be treated without undue effect upon the skin. Still the amount of X-rays very rapidly diminishes as it passes through the tissues and this explains why therapeutic results are less perfect the deeper the lesion except in the case of cells with special susceptibility as in leucæmia. Metallic screens to filter out the less penetrating rays are not a success; about all they do is to make the time of exposure very much longer.

Quantity depends on the amount of X-ray emitted by the tube, on the duration of exposure and on the distance of the surface to be treated from the anticathode. As the quantity absorbed varies inversely as the square of the distance, the surface, if irregular, large, or convex, may have to be treated in sections.

Methods of application. The old way of making applications every day until a reaction appears was empirical and dangerous and is being abandoned. Nowadays the quantity may be measured, and it may all be given at one session or it may be divided into several. He prefers to apply the entire quantity necessary to a cure at a single application if that is compatible with the comparative integrity of the skin. If several applications are decided upon make them at the shortest intervals compatible with the integrity of the skin. In tinea 4½ or 5 H., and this surely should be applied at one dose. Pruritus, eczema, seborrhœa, etc., require 2 to 4 H., and this should be applied at one dose. Non-ulcerated neoplasms, even when cutaneous, require much more than can be safely given at one dose. He gives a quantity (3 or 3½ H.), which can be repeated once a week. Larger doses, 4 or 5 H., require an interval of two weeks. When lesions are ulcerated it is sometimes necessary to apply a strong dose, 10 H. per exposure. Then wait 20 days and make another application not quite so strong. Then again certain neoplasms do not begin to retrograde until a strong application has been made. It is never necessary to excite a severe dermatitis that has no curative effect in itself.

4. Max Kohl manufactures a radiolimitator like Albers-Schoenberg's compression cylinder except that it is not placed on or attached to the table. There is a broad, heavy base resting upon the floor with a vertical column from which a horizontal arm projects near the table. The Polyphos Co. make a table for performing operations under the guidance of the X-ray. The X-ray tube is in an impermeable box above the field of operation. Under the field of operation and forming part of the top of the table is a fluorescent screen with face down and protected on top by a thin sheet of aluminum, which may be thoroughly disinfected. The image on the under surface of the screen is reflected by a mirror under the table. All the parts under the table are in a dark box. There is a telescopic tube at a convenient angle through which the operator views the fluoroscopic image, while with the other eye he looks directly at the field of operation. The tube stand forms part of the table, and the current may be turned on and off by a foot switch.

BULLETIN OFFICIEL DE LA SOCIETE FRANCAISE D'ELECTROTHERAPIE ET DE RADIOLOGIE.

Paris, France, June, 1905.

1. Epithelioma and High Frequency Currents. — Dr. Lacaille.
2. The Ziegenberg Storage Battery. — Dr. Billinkin.
3. Blenorrhagic Monoarthritis Cured by the Galvanic Current. — Dr. Billinkin.

1. Lacaille alludes to the fact that Bergonie and Oudin have already published results with this method. His first patient was a woman of 79, with an epithelioma of the nose, which recurred in a hopeless fashion in spite of several removals by the knife, the thermocautery, and caustics. When he saw her for the first time there was a depression about an inch in diameter on the dorsum of the nose, due to the old operations and presenting a recurrence with sanguinolent discharge at its border. At the first treatment 3 H. of the X-ray were applied to the epithelioma, but there was also a "noliure tangere" on the cheek and another on the forehead. These had very little thickness and were about one centimeter square. For these he applied Bergonie's method of high-frequency application.

When the patient returned eight days later these places were covered with a raised crust and were not treated at all. The epithelioma showed no change, and 3 H. of X-ray were again applied to it. The patient was away for three weeks, but reported that the crusts had fallen off from the spots treated by high-frequency currents in about fifteen days. A single treatment had sufficed to cure two patches of "noliure tangere," and no trace remained of them. At the request of the patient the X-ray was discontinued, and high-frequency currents were applied to the epithelioma. The first application extended distinctly beyond the lesion. Fifteen days later the crusts had fallen off, leaving a very small zone of disease along the border of the depression, which required two more applications at intervals of two weeks. At present, six months after the treatment, there is no trace of epithelioma either on the nose, forehead, or cheek.

A 10-inch induction coil was used with a Contremoulin interrupter. Direct 110 volts current with oil condensers. Monopolar D'Arsonval. The electrode was the point of a metallic exciter for static use. The patient's head rested solidly on the back of the chair. The apparatus being in operation he holds the insulated handle of the electrode in his right hand, places his left hand on the patient near the affected area, slides his right hand along the electrode until he holds the metallic part and then applies the point to the patient without any shock at all. Then changing his hold on the electrode back to the insulated handle and directing the patient to keep very still he takes away his left hand and the patient is now receiving the discharge from the metal point. The point is then withdrawn a few millimeters from the surface and a stream of sparks is applied to one spot for only a few seconds. An intense congestion is produced, followed by a blistered appearance. An adjoining part is then treated, and so on until the whole disease and some of the surrounding skin has been treated. This takes about a minute per square centimeter.

A few minutes later the part assumes a brownish aspect and then commences to secrete a more or less sanguinolent serum, which persists for 24 or 48 hours. The part is the seat of a rather painful sensation. Little by little a crust forms, which falls off on the tenth to the fifteenth day, leaving a healed cicatrix after one or several treatments. Other cases at present under treatment are a "pearl" epithelioma of the oculo-nasal angle and another of the temple. The first seems cured. The last received applications of 6 H. of X-ray and began to show signs of improvement, but, reading of blindness caused by X-ray treatment about the eye, the treatment was changed to high-frequency currents. It is noticeable that the visible effect immediately after the treatment is greatest on

the diseased area, and is less on the healed center and on the surrounding skin.

In the discussion by Billinkin, Laquerriere, Delherm, Lacaille, Chabry, Barret, and Oudin the opinion was expressed that the action was not simply that of a caustic, and while some cases of epithelioma were cured, in other cases a crust formed and came away, leaving the case very much as before.

2. Billinkin enumerates the advantages claimed for Ziegenberg's new accumulator or storage battery. Its weight is small, it gives 55 watt-hours per kilogramme of total weight. Even after short circuiting, which will stop any ordinary storage battery, this one quickly regains its entire charge. It is composed of positive plates of oxide of lead treated with a secret preparation, and negative plates of an alloy of zinc. There are five positive and six negative plates in an element and this weighs 8 to 10 kilogrammes. The positive plates are treated by a secret solution, which gives them porosity and renders them proof against injury by short-circuiting.

The accumulator is charged in series and at low voltage and high amperage. The voltage of the accumulator is 2½. The loss of zinc is 1 28/100 grammes per ampere-hour. After a discharge of 50 amperes for 3 hours from an element the voltage was found to be 1 84/100. On short circuit there is an extraordinary amperage developed (sometimes even 1,200 amperes), the temperature rises to 100° C., the conducting wires may melt, but no injury is done to the plates.

A battery weighing 350 to 400 kilogrammes will run an electric automobile 200 to 250 kilometers at high speed; while the present storage batteries weigh 800 kilogrammes and run scarcely 60 or 70 kilometers. The new battery will stand 300 or 400 rechargings, while the present ones stand scarcely 100. The cost of recharging is 200 francs a year for the new one and 4,500 francs for the present type.

3. The patient was a man of 24, who contracted gonorrhœa on October 18th, and October 24th the left wrist became so painful that it could not be moved. On the 25th he took 1 gramme of antipyrine and rubbed the wrist with liniment. The wrist swelled up and he began taking salicylate of soda. The 29th there was no relief and the wrist measured 21 centimeters in circumference, while the other was only 16. There was absolute immobility of the wrist. Temperature 38 4/10° C. On this date, October 29th, 120 milliamperes galvanic current was applied for 15 minutes. Metallic plates 24 x 16 cm. were used as electrodes with a dozen compresses wet with tepid water. Positive pole on the right "coup de pied," which was somewhat painful; negative pole covering the whole hand and three-fourths of the forearm. There was very great relief, and on the following day the same strength of current was applied for 20 minutes, with four interruptions of 30 seconds each. On October 31st and November 1st the same treatment. Soreness much less and swelling gone. Wrist measured 17 cm. December 2d (is not this a misprint in the original for November? Ed.) the same treatment, wrist measures 17 cm. December (?) 3d application of 50 milliamperes. The patient seems entirely well. The patient had been taking 70 centigrammes of sulphate of quinine daily on account of the slight fever.

A discussion ensued in which several members expressed the opinion that moist clay electrodes were the best for currents of great intensity, Billinkin replying that he had used clay electrodes and had found that they produced as great sensation as others and he had sometimes produced burns.

JOURNAL DE PHYSIOTHERAPIE

Paris, France, July 15, 1905.

1. Muco-membranous Entero-colitis (special indications for treatment by the Vichy cure). — Dr. L. Salignat.
2. Massage in Industrial Accidents. — Dr. Louis Lievre.
3. The Importance of Dosage and Method in the Radiotherapy of some Neoplasms. — Dr. J. Belot.
4. Cancer of the Neck of the Uterus Successfully Treated by Radiotherapy. — Dr. G. Haret.

1. Hyperchlorhydria, ulcer of the stomach, biliary lithiasis and renal lithiasis are the special causes of muco-membranous colitis which are remediable by the Vichy treatment. There are the following indications for treatment: 1, to modify the neuroarthritic diathesis; 2, to correct the habitual hypersthenia; 3, to suppress the local functional troubles of the intestines; 4, to suppress the cause of the trouble by treating first of all the organ which is the determining cause.

All the Vichy waters accomplish the first indication. For the second indication certain hydrotherapeutic measures are employed, chiefly sedative. For the local functional intestinal troubles he uses the Vichy *en boisson,* mineral baths, local douches, massage, electricity or finally intestinal lavage.

Especial reliance is placed upon the proper treatment of the organ which is the exciting cause of the intestinal troubles. Diet is carefully studied. The energetic action of the Vichy waters upon the liver explain their curative effect upon the constipation which accompanies this disease. The baths last about half an hour and are generally diluted with half or two-thirds ordinary water, as the pure mineral water is too stimulating. The temperature is 35° or 36° C. They stimulate nutrition and diminish nervous excitability.

The tepid douche is at a temperature of 37° to 38° C. and strikes the body with little force. The progressive hot douche begins at 36° and rises to 40° C. With the latter much more powerful tono-sedative effects are produced and without the exhaustion which follows the tepid douche. The special hydrotherapeutic measures are the bath in the pool (*bains de piscine*), baths in running water, submarine douche, and ascending douches. In the pool the patient may lie or sit and since it is often continued for a long time he can read, etc. The temperature is either 28°, 32°, or 34° C. With the patient completely submerged the general anti-spasmodic and decongestive effects are produced. The effects are localized in the abdomen if the water reaches only to the level of the lower part of the thorax. The submarine douche is given to the patient lying in a bath-tub of water, holes in the bottom of the tub admit a stream of water of the proper temperature and pressure. Sedative and tonic effects are produced and a veritable hydriatic massage of the abdomen may be applied. The ascending douche had better be cold, the patient lying on his back and only a quart or two of water used at a pressure of about three feet. It is to be watched, as it sometimes causes syncope; it is not very often used.

Lavage of the intestine is produced under a pressure of 40 to 50 cm., about 1 liter or 1½ liters at a temperature of 38° C., the Chomel water being most sedative to the mucous membranes and may be used pure or diluted. The patient is lying on his back. First one-quarter liter is introduced into the rectum very slowly and then expelled with any fecal contents. Then half a liter is introduced and expelled. Finally the rest of the prescribed dose is introduced without any disagreeable sensation whatever. These douches are at first given every two or three days, but later are longer apart to avoid producing the pernicious habit of depending upon the douches for a movement of the bowels. The abdominal massage is light and prolonged for 25 or 30 minutes. "Effleu-

rages," frictions, pressure, and vibration are applied all over the abdomen, but especially along the course of the colon and along the biliary tract. The objects are to relieve intestinal spasm, to increase biliary secretion and to remedy local circulatory troubles. It is applied every day that the intestinal lavage is not used. As to electrotherapy he uses interrupted galvanization (Doumer), galvano-faradism (De Watteville) or especially the modification of the latter proposed by Delherm. The last is fine, especially in cases where nervousness predominates.

2. In France the accident insurance companies have done a great deal toward substituting the services of uneducated measures for those of the physician in case of all kinds of injuries. Lievre recognizes the importance of mechanical treatment to prevent stiffness after fractures, sprains, and dislocations, and also after wounds, but he sees a great danger to the workingman when the charge of the case is in the hands of a man whose only education perhaps has consisted in service as a hospital orderly or something still less promising.

3. See THE ARCHIVES for September, 1905, page 140.

4. The patient, 75 years old, had complained since September, 1904, of abdominal pain without leucorrhœa or metrorrhagia. Dr. Delauney, to whom her physician sent her for operation, found an ulceration of the left side of the neck of the uterus, extending to the right cul de sac. It was about 3 centimeters long and 1 cm. wide, the base was not distinctly defined to the touch and a bleeding portion could easily be scooped off by the finger. No induration of the broad ligament. No microscopical examination was made. The case was deemed inoperable on account of the patient's age and because of the involvement of the vaginal wall. X-ray treatment was begun December 7, once a week, the surface treated absorbing 4 H. each time. A speculum was introduced and immobilized by fastening it to the table. The X-ray tube was enclosed in Dean's lead glass shield with a lead glass cylinder entering the vagina. The anti-cathode was at a distance of 20 centimeters from the ulceration. The pain was less after the second treatment and disappeared after the fourth. By this time the ulceration was healed. There were six treatments in six weeks, with a total of 24 H. and No. 6 rays. No induration could be found and the surgeon on examining her pronounced her cured.

LE RADIUM

Paris, France, July, 1905.

1. Treatment of Skin Cancer by Radium.—J. Rehns and P. Salmon.
2. Measuring Instruments in Medical Radiology. — J. Belot.
3. Researches on the Radioactivity of the Atmosphere and of the Soil. — H. Geitel.

1. The authors give their experience in the treatment by radium of two cases of true cancerous tumor of the face. In both cases a cure was apparently effected. The treatments occurred once in several days for 70 or 80 days. A half-hour exposure to 30 millograms of pure radium bromide, properly enclosed, was the method. It is assumed that the effect is much the same, if not identical, with that produced by Roentgen rays, but there is an advantage over the latter in that radium is very easily applied and can be used in sensitive regions about the eye without danger to adjacent parts. Also in many country places where apparatus for generating the Roentgen rays is not available, the radium method is especially convenient.

2. This article, like many others that have appeared in recent years, is a strong

plea for exactness in the practice of electrotherapy. That all the energy and force factors involved should be measured and recorded in every case is the contention, implying as much intelligence and care in the application of electricity in its various forms as has long been insisted upon in the administration of drugs.

3. This is the second article of the series on the above subject begun in the June number of *Le Radium*. The loss of an electrical charge from an insulated body has been studied many years ago by Coulomb and ascribed in a general way to what was called the "conductivity of the air." Investigation of the subject, however, since the discovery of radioactivity by Becquerel in recent years leads conclusively to the belief that this conductivity is of quite a different nature from what was formerly supposed, and is due to ions present in the air which have been produced continuously by the radioactivity of the gas itself or to that of other matter in the vicinity. In other words radioactivity, primary or induced, seems to account for, by the ions it produces in gases enclosed or free, the conductivity of the gas for electricity.

In the present article the author speaks in the order given, of the natural ionization of the air, its radioactivity, the radioactivity of the soil, and the natural conductivity of the air as a phenomenon of radioactivity.

MISCELLANEOUS ABSTRACTS

ELECTROTHERAPY

A CASE OF SACCULATED ANEURISM OF THE ABDOMINAL AORTA, TREATED BY THE INTRODUCTION OF SILVER WIRE AND THE PASSAGE OF THE CONSTANT CURRENT

Cornelius A. Griffiths, *London Lancet*, August 12, 1905.

The tumor was in the epigastric region, lying almost entirely left of the middle line, extended up under the ribs and downward nearly to the umbilicus, its size being about that of a cocoanut; it caused some bulging of the epigastrium, was distinctly pulsating, and presented a well-marked systolic bruit. Pain was constantly present in the back and at the left side and also in the epigastrium following the taking of food; occasional retching, but no actual vomiting.

After patient was prepared for an aseptic operation an incision was made a little to the left of the middle line over the tumor, the abdomen opened, the aneurism presenting immediately below the diaphragm and above the lesser curvature of the stomach, the latter viscus being closely applied to and stretching around the left and lower borders of the aneurism. A spot devoid of large vessels was selected on the tumor and a small circle of tissue enclosed in a purse-string suture; through the center of this circle a fine, long, metal trocar and cannula were thrust well into the sac, the trocar withdrawn and a vulcanite insulating cannula substituted through which fine silver wire was introduced into the sac. About six feet of wire were passed in, connected to the negative pole of a constant current battery, and 15 to 25 ma. passed for 15 minutes. At the end of this time it was noticed that the tumor was harder and the pulsation had grown less. The cannulæ were then with-

drawn, purse-string suture tied, and the abdomen closed, whereupon it was noticed that the bulging caused by the tumor had almost disappeared. Patient died in about five hours apparently from shock.

Post-mortem examination showed that the aneurism came off from the main trunk of the abdominal aorta, that the sac was filled with a dark clot about the coiled wire and that a double loop of the wire had been passed for about two inches up into the thoracic aorta. Such passage of the wire is believed to be a condition which should be avoided if possible and the immediate clotting of the blood within the sac by the passage of a small current is believed to be of advantage.

Griffiths believes that, although his own case died, the results reported by others justify one in hoping that this management of aneurism may prove to be of some benefit in the future.

GALVANISM AS A CURATIVE AGENT IN NERVOUS DISEASES: THE IMPORTANCE OF EQUIPMENT AND TECHNIC.

William Broaddus Pritchard, *Medical News*, August 5, 1905.

In organic central lesions with destruction of tissue, the employment of the galvanic current with any hope of remedial or directly curative results, constitutes an instance of the *reductio ad absurdum*. Hemiplegia, degenerative myelitis, necrotic softening from any cause, are, with rare exceptions, of this inappropriate group. Personally the author has never seen any decided *propter hoc* benefit in tabes from this or any other current, although Erb recommends it as distinctly helpful in this affection. In actively inflammatory or actively irritative central diseases, as meningitis, acute myelitis or in brain tumors, it is positively and obviously contra-indicated. In the nuclear palsies, including poliomyelitis — although this disease is not usually so classified — Pritchard has never seen any specific benefit from its use, nor does he see on *a priori* grounds any rational basis for such belief.

It is, however, in the field of peripheral nerve diseases, including many of the neuroses, nearly all forms of neuritis, the tics, vasomotor and trophic affections, and the paresthesiæ of whatever cause, that galvanism occupies a position of positive and indispensable importance. To this group he would add, from experience, the fatigue psychoses, the headaches, and cerebral conditions underlying the obsessions of neurasthenia, and of simple affective melancholia.

To get the best results, it is necessary to have a proper equipment and to know how to use it — a good workman and good tools are both essential to good work. Precision in dosage and a guiding principle in the method of application are just as vitally important in employing electricity as accuracy in the dosage or in the selection of appropriate media for solution or in an observance of chemical laws in drug administration. "It is remarkable that with an agent of acknowledged value for more than a century there should still prevail such haphazard methods and absolute lack of systematized technic in its use. Galvanism's step-sister, the X-ray, an infant by comparison, has been treated with far more dignified consideration; an elaborate technic and most highly specialized expertness are admittedly demanded in its employment, and yet there is far less positive evidence of important value in the records of achievement for this agent so far, whatever may be its future, as compared with galvanism. An old and familiar story to me is that of the patient who, when advised that galvanism is indicated, tells me he has used it with no benefit, that his physician had tried it or had told him to get a battery and use it himself. As well tell him to

go home and operate on his own hernia or apply his own spinal brace. Inquiry revealed the fact, as a rule, that it was a faradic battery of very limited use in neurology and in many cases positively harmful and distinctly contra-indicated. If a galvanic battery, it was without meter or rheostat, leaving the patient to guess at the quantity by his sensations, an absolutely unreliable standard; and to the often harmful effects of interruptions and shock from lack of current control by the rheostat."

The ordinary sponge electrode is utterly disapproved of upon both hygienic and therapeutic grounds, those recommended being constructed as follows: "The electrodes are made of pliant metal, permitting even adjustment to all surfaces, especially when covered. Instead of a permanent covering, I use clean towels, several times folded to a sufficient thickness, and thoroughly wet in hot water. Salt water is not necessary. The towel edge should overlap the metal to prevent burning or local concentration of the current. The electrodes are made as large as possible, in order to get a maximum of diffusion at the point of current contact, with a resulting minimum of discomfort as one object, and sometimes a maximum benefit from a maximum amount of electricity for another. The smaller the electrodes the less the amount of current we can use, because of the irritant and often harmful concentration. With large electrodes also, the prolonged use of the current is easily possible. Seances of less than 20 minutes are the exception; an hour is often indicated as in old sciatica or sacrolumbar neuralgia. Most patients suffering from nervous diseases are "nervous," fidgety, restless. You must make them comfortable for the 20 minutes or the hour required." With this object in view the electrodes are equipped with a strap attachment securing firm fixation, thereby insuring freedom from pain and shock from interruptions far more positively than if held by an attendant, whose hand, from fatigue or inattention, becomes unsteady, and the patient is free to change constrained and wearisome positions from time to time. He can cross his legs, put his feet on the table, handle his book or cigar, although it may be a sciatic or an ulnar or a facial nerve or a headache you are treating. Equally important is the state of mental relaxation from reassurance as to freedom from the fright and danger of shock from interruption.

A REPORT OF CASES OF ELECTRICAL BURNS FROM "LIVE WIRES"

H. H. Oldright, *Dominion Medical Monthly*, August 1, 1905.

Oldright says the shock from high-voltage currents, when sufficient to produce death, seems to act through either paralysis of the respiratory centers or a condition of tonic fibrillary contraction of the heart muscles. If the current passes from the hand or head to the foot through the body, this condition of the heart is found, but if the current passes through the cerebro-spinal centers, as in a hand to hand contact paralysis of these centers may be expected. In either case the treatment is artificial respiration and rhythmical traction on the tongue.

In electrical burns the current acts not only on the epithelial layers, but causes a degeneration of the underlying tissues, varying in degree with the strength of the current, and the length of the period during which it passes.

He reports a case of a man who came in contact with a cable carrying 22,000 volts. Where a wet arm touched the cable he received a burn 4x9 inches in area. There were also deep burns on the forearm, a slight one on the abdomen, the sole of the foot was blistered, and the base of the great toe burned to the bone. It is found in these cases that following the burns, the muscles fre-

quently degenerate and slough, even up to their insertions. The best treatment for the burns is a dry antiseptic dressing from the beginning. A tendency to hemorrhage should be expected during the separation of the sloughs. Healing is slow owing to the depth of the burn, and the lowered vitality of the tissues. In his case the burns were more than two months in healing, although the sloughs were removed surgically and skin grafting was employed. In the case of a man who met death while attempting to rescue a fellow-workman, there was discovered, post-mortem, intense engorgement of the lungs, resembling pneumonia. The right heart contained fluid blood; there was no external mark on the skin. This case evidently died from shock, causing a paralysis of the heart-muscle.

RADIODIAGNOSIS

X-RAYS AS APPLIED TO THE DIAGNOSIS AND TREATMENT OF PULMONARY TUBERCULOSIS: OUT-DOOR TREATMENT OF CONSUMPTIVES

Howard Percy Deady, *North American Journal of Homeopathy,* August, 1905.

The author depends chiefly upon the fluoroscope in the diagnosis. He places the patient upon a revolving stool with both hands clasped over the head, at a distance of from three to twelve inches from the tube. The tube should be placed directly in line with the spinal column. He prefers the screen because it includes a larger area than the ordinary fluoroscope.

He says that in 75 per cent. of the cases the normal lung is brighter at the left apex than the right. The earliest signs are a hazy appearance at the apices of the lung. He then says that a thickened pleura may form at the apices normally and thus make the diagnosis more difficult.

He has never obtained a skiagraph which showed satisfactorily the incipiency of tuberculosis. Pleural effusion, according to this author, gives a sharp line, and if a consolidation be present in addition the patient may be shaken when the fluid is plainly visible. He even states that when the patient is shaken the fluid becomes turbulent like water in a vessel. This sign is characteristic and admits of but one diagnosis. If the agitation only requires slight effort, it is serous, while a sluggish movement would point to pus or fluid of greater consistency.

The diaphragm in asthma has a characteristic fluttering motion.

Therapeutically the author states that he has frequently noted the hemostatic effect of the X-rays in pulmonary tuberculosis. He claims, however, that it is not feasible to apply this agent in acute hemoptysis, but that the greatest possible benefit has been noted in connection with chronic hemorrhage or with the so-called "bleeders."

In the treatment of pulmonary tuberculosis, the author uses a high vacuum tube at a distance of from 15 to 18 inches. The time of the exposure varies from 5 to 15 minutes, and is repeated from 3 to 5 times a week. Upon advanced cases where the vital resistance has not been entirely lost the effect is often startling. The subjective symptoms seem first to respond and the amelioration of the septic manifestations of lessened cough and expectoration, are often the stepping stones to a new lease of life, if not a substantial arrest of the chill, fever, and sweat, together with disease.

RECURRENT TUBERCULOUS PERITONITIS AFTER INCOMPLETE OPERATION, WITH A REPORT OF SUCH A CASE TREATED BY THE X-RAYS

John B. Shober, *New York Med. Jour.* and *Phila. Med. Jour.*, August 5, 1905.

Shober says that we are all familiar with the good results that follow operation for tuberculous peritonitis, but we also know that recurrences are frequent, and, as pointed out by Mayo, are most likely to occur if the primary focus of the disease has not been removed at the time of the operation. The case reported was of the advanced form of the disease, and on account of the dense adhesions a complete operation was impossible. A recurrence developed three months after the primary operation. The patient refused a second operation. The X-rays were applied at regular intervals for periods of from 7 to 10 minutes, at a distance of 10 inches from the anode. A high vacuum tube was used and enough current to enable the operator to see the ribs and the liver with the fluoroscope. The pain was relieved and the tumor masses which had appeared from time to time were made to disappear.

The author draws the following conclusions:

1. Until we have more precise methods of diagnosis, most cases of tuberculous peritonitis will be operated upon under some other diagnosis.

2. Celiotomy and removal of the primary focus of the disease offer the best prospect of cure. The abdomen should be thoroughly irrigated and closed without drainage.

3. A short course of X-ray treatment immediately following operation is advisable in all cases, but it is especially important in those cases in which the primary focus has not been removed.

4. Should recurrence take place a second operation — to remove if possible the primary focus — is advisable; and this operation should be followed by a course of X-ray treatment.

THE TREATMENT OF SCALP RINGWORM — SOME GENERAL RULES OF PROCEDURE

T. C. Fox, *Pediatrics*, August, 1905.

During the course of a very interesting and instructive consideration of this subject Fox refers to the use of Roentgen therapy as follows:

"This is a method of depilation which must revolutionize the treatment of ring-worm. Experimenters have been somewhat timorous with this method. Two or three years ago, Dr. Mills effected an excellent cure for me of an extensive scalp favus at the Westminster Hospital, and of late I have been sending all my cases to the Light Department, where Dr. Sale-Barker has been uniformly successful without any mishap. By a suitable dosage and selection of the rays, which can now be regulated, and their concentration on a diseased area the hairs can be made to fall without serious damage to the scalp, and they are replaced after an interval of some weeks by a healthy, new growth. From every point of view this must become the treatment for the future wherever the rays are obtainable. It is painless, and comparatively rapid and economical. All danger of infection to others is rapidly removed, and the only drawback is a somewhat prolonged period of more or less baldness. In the Municipal Ringworm Schools of Paris this method has now been definitely established by Sabouraud."

DISAPPEARANCE OF RODENT ULCER UNDER THE APPLICATION OF THE X-RAYS

Frederick B. Jefferiss, *London Lancet*, July 29, 1905.

The patient was an elderly woman exhibiting a growth on the left frontal re-

gion as large as a five-shilling piece, rounded in shape and very much raised, the ulcer on the top of the growth being about half an inch above the level of the surrounding skin, so that the whole growth was crateriform in appearance. It bled easily, was freely movable, none of the neighboring glands were involved, and it had existed for two years, during which time it had steadily increased in spite of different kinds of treatment. Roentgen therapy was begun on March 5, 1904, two sittings a week of five minutes' duration each. "No change was noticed until after the fifth application, when the surrounding skin, which was not completely covered by the mask of lead-foil I was using as a shield, showed some signs of inflammation. At the next sitting the ulcer had increased in size and after that the elevation of the growth became less marked as the treatment was continued, until after the sixteenth sitting the ulcer was level with the surrounding skin and of about the size of a half crown. As the reaction was marked the treatment was stopped for ten days and the ulcer was dressed with boric acid ointment. When next seen by me the ulcer was smaller, showing a healthy healing edge, and after four more applications of the rays it had quite healed, just over three months from the first application. At the time of writing, seven months since the ulcer healed, there is no sign of recurrence and no scar is visible."

FINAL RESULTS IN THE X-RAY TREATMENT OF CANCER, INCLUDING SARCOMA

William B. Coley, *Annals of Surgery*, August, 1905.

Since February, 1902, Coley has had under treatment by the X-ray 167 cases of malignant disease classified as follows:

Sixty-eight cases of sarcoma; 36 of carcinoma of the breast; 44 of epithelioma of the head, face, and neck, including the tongue; 14 of deeply-located abdominal growths, probably carcinoma; and 5 not classified.

Of the cases of sarcoma complete disappearance of the tumor obtained in 5, but in every one recurrence took place a few months later. In two of these cases the recurrent growth disappeared again under the combined influence of the Roentgen ray and mixed toxins. These two cases are still well at the present time. One other died of internal metastases, one was a local recurrence, and the fifth disappeared again under the Roentgen rays and mixed toxins, but recently another recurrence appeared, which had not, up to the time of writing, yielded to further treatment with either X-rays or toxins. After having given the Roentgen ray a very careful trial in these 68 cases of sarcoma which involved almost every locality, he feels forced to the conclusion that "while in certain rare cases, especially of sarcoma originating in the lymphatic glands, improvement may be very striking, going so far, in some cases, as to cause entire disappearance, there is almost always a speedy recurrence, either local or metastatic, and that the influence of the X-rays upon sarcoma is rarely, if ever, curative. The case of Skinner may prove the single exception to this rule, although sufficient time has not yet elapsed to justify us in considering it a cure."

A short history of Skinner's case, which was reported at the International Electrical Congress at St. Louis, in September, 1904, is given. The growth was a large abdominal tumor (fibrosarcoma) which disappeared entirely under 136 applications of the Roentgen ray extending over a period of 849 days, and the patient had remained well without any signs of recurrence for a year.

The 36 cases of mammary cancer included almost every variety of the disease as found in this region. In only

one case has Coley seen entire disappearance of the tumor, although in another the growth does not appear to have increased any. In four cases the Roentgen ray was applied immediately after operation for a primary growth in order to lessen the probability of recurrence, yet in every case recurrence, either local or in the form of general metastases occurred within a year's time. He does not therefore feel justified in concluding that the ray has any influence in preventing recurrence.

Of the 44 cases of epithelioma of the head, face, and neck, 10 were epithelioma of the nose, and 10 superficial epithelioma of the face. In only four cases did the disease disappear entirely, and in no case in which the glands of the neck were involved was any improvement whatever noticed, or any effect in retarding the disease. Of four cases of carcinoma of the abdomen probably originating in the sigmoid or cæcum, the growth decreased slightly in size and the pain was somewhat lessened in one, but the others were absolutely unaffected.

Four cases of cancer of the larynx and one of the esophagus showed absolutely no improvement under treatment. A careful study of the cases of other men as well as his own, that have been kept track of to their final conclusion, leads Coley to conclude as follows:

"1. That the X-ray exerts a powerful influence upon cancer cells of all varieties, but most marked in cases of cutaneous cancer.

"2. In some cases, chiefly in superficial epithelioma, the entire tumor may disappear, probably by reason of fatty degeneration of the tumor cells with subsequent absorption.

"3. In a much smaller number of cases of deep-seated tumors, chiefly cancer of the breast and glandular sarcoma, tumors have disappeared under prolonged X-ray treatment. In nearly every one of these cases, however, that has been carefully traced to final result, there has been a local or general return of the disease within a few months to two years.

"4. In view of this practically constant tendency to early recurrence, furthermore, in the absence of any reported cases well beyond three years, the method should never be used except in inoperable cases, or as a prophylactic after operation as a possible, though not yet proven, means of avoiding recurrence.

"5. The use of the X-ray as a preoperative measure in other than cutaneous cancer is contra-indicated, 1, because the agent has not yet been proven to be curative; 2, because of serious risks of an extension of the disease to inaccessible glands or to other regions by metastases during the period required for a trial of the X-ray."

THE X-RAY IN MALIGNANT GROWTHS AND IN OTHER PATHOLOGICAL CONDITIONS

C. M. Greiner, *International Journal of Surgery*, August, 1905.

Greiner states that the X-ray has been employed in the treatment of malignant growths since 1896, and we are now able to allot its status and define some of its limitations. From a study of the literature, he believes the consensus of opinion is that the removal of large carcinomatous growths by excision is the proper treatment, since the destruction of the mass by the X-ray is apt to cause a toxemia, but surgery gives a high percentage of success when combined with radiotherapy. He has treated two patients where the disease was inoperable on account of location and general condition of the patient. They died as the result of failure to eliminate the toxins of broken down tissue. A febrile action should be a signal to discontinue treatment temporarily until the system has

eliminated the accumulated toxic material. He advises the use of the rays in cancer of the breast for two to four weeks before excision, and a resumption of treatment as soon as possible following operation. If this be done it is frequently unnecessary to disturb the axillary glands.

Cases of recurrence following operation were apparently cured by the X-ray with no recurrence in two years. In mild doses the X-ray has a tonic action on tissues. It has been observed that the caliber of blood vessels becomes smaller and the lymphatic glands become shrunken under radiation, and if continued atrophy of tissues follow. Therefore by radiotherapy before operation, the outlying cancer cells are destroyed and metastasis is guarded against, thus the weak point in surgical removal is obviated.

In former days many cases of cancer of the breast were removed as widely and deeply and as early as possible, but there remained cancer cells in the surrounding tissues which could not be eradicated if sufficient tissue were retained to cover the wound and to avoid dangerous encroachment upon important structures. These cases promptly recurred. Today radiotherapy combined with operation is giving a much higher percentage of successful results in this class of cases.

He reports a case of cancer of the tongue, the entire tongue being destroyed, the left tonsil involved with the floor of the mouth and all the lymphatic glands. After six treatments the patient complained of very little pain and remained practically free from pain until his death.

Physicians who thoroughly familiarize themselves with this treatment are able to administer proper dosage and obtain desired results without injury to the patient.

In lupus, tuberculosis of joints, and adenitis, better results are frequently obtained than by any other method. Tubercular joints if containing pus should be aspirated, injected with an emulsion of iodoform glycerine, placed in fixation splints, then rayed through the splints. If the bone is not necrosed, results are soon evident. Lupus usually yields readily. He considers that since the mortality of malignant disease if treated by caustic or surgery alone is very high, we are in honor bound to use every means of treatment instead of depending upon one alone.

EXPERIMENTS WITH RADIUM EMANATIONS

Wendell C. Phillips, *Medical News,* August, 19, 1905.

At the suggestion of Mr. Hugo Lieber, the author had a tube constructed in such a manner that the interior could be coated with radium salts, and the emanations thus obtained used experimentally.

Dr. Phillips goes over the literature extant on the subject, giving a brief historical resumé, and noting the various authorities and the origin of the radium emanations from the salts of radium. He conducted a series of experiments to determine whether the radium emanations were possessed of any bactericidal power before he applied their action to the living patient. Briefly stated these experiments were as follows: A pure culture of streptococcus was exposed for a period of two minutes several times during the day, and it was found that the bacteria did not lose their activity. Inoculations from the exposed culture grew in new media with the usual speed, and the culture itself showed no effect from the action of the emanations. A culture made from a pure culture was exposed immediately after inoculation for the same time, the exposure taking place before the newly inoculated media was placed in the incubator, and it was found that the new culture prospered in the

usual manner. A mixed culture taken from an ear discharge was in no way affected by exposure to the emanations.

In view of the negative action on the bacteria the author did not believe it wise to continue the experiments along these lines, but applied the emanations to the following conditions to determine whether or not any action would result from their application on the pathological lesions.

In four cases of purulent otitis media, one of which was accompanied with large polypoid masses in the external auditory canal and another of which was demonstrated to have been caused by a bacillus closely resembling the Klebs-Loeffler bacillus, were subjected to the emanation. In none of these cases was there any change noted in the pathological lesion except a slight reddening of the surface of the polypoid mass which lasted for a few minutes.

The emanations were also applied to a case of chronic ethmoiditis et sphemoiditis without result; and to two cases of atrophic rhinitis, one of which was complicated with a dry chronic middle ear catarrh, and the other with a simple ozena. In none of the cases was there any improvement due to the emanations.

The treatment having been employed for considerable time without results, the author concluded to publish his unfavorable results, although he regrets that his report is incomplete, as he had no chance to try the effects of the emanations on either benign or malignant tumors, syphilitic ulcerations, tubercular ulcerations, or in thoracic diseases. The laboratory experiments were carried out with great care.

DIETOTHERAPY

THE THERAPEUTICS OF ALKALINE-SALINE SULPHATED WATERS

George Thomas Palmer, *The Chicago Clinic and Pure Water Journal,* June, 1905

These waters contain sodium sulphate in addition to sodium carbonate and sodium chloride.

The best known of the cold waters of this class, in Europe, are Franzenbad, in Bohemia; Marienbad, also in Bohemia; Rohitsch, in Styria; Elster, in Saxony; and Tarasp-Schuls, in Switzerland. Of the hot waters, those at Carlsbad, and at Bertrich, in Rhenish Prussia, are well known.

In the United States, the cold waters of this class are Aqua de Vida, Castalian Mineral Spring, and Gordon Seltzer Springs, in California; Springdale Seltzer Spring, in Colorado; the Topeka Mineral Wells, in Kansas; the Harrodsburg Springs, in Kentucky; and the Gibson Mineral Wells, in Texas.

The hot waters include the Castle Creek Hot Springs, in Arizona; Geyser Spa and the Harbin Hot Springs, in California; Idaho Hot Springs, Manitou Springs, Pagosa Hot Springs, and Royal Gorge Hot Springs, in Colorado. These lists are not complete. Probably in 20 states of the union good examples of these waters may be found.

The cold sodium sulphate waters have a marked diuretic action, particularly if there is considerable carbonic acid gas present. In large doses they are purgative, increasing peristalsis and liquefying the intestinal contents.

The warm waters contain less sodium sulphate. They diminish the urine and have much less effect on the intestinal tract. They retard retrogressive metamorphosis of nitrogenous matters and in-

crease decomposition of fat. There is a distinct solvent action on uric acid, and stimulation of the secretion of bile.

The warm sodium sulphate waters are beneficial in severe cases of gastric and intestinal catarrh, and in ulcer of the stomach, as well as in catarrhal jaundice, hyperæmia of the liver, cholelithiasis, urinary concretions, and in diabetes, especially of the gouty type.

The cold waters are useful in the same conditions, but are better adapted to the plethoric and robust. They have proven useful in the treatment of obesity. They reduce the fat without injuriously affecting the digestive processes or the general health. But the fat is taken on again very quickly, unless a rigid diet is adhered to.

The hot sodium sulphate waters at Carlsbad enjoy a great reputation in the treatment of gallstones. It is said that patients with this disease seldom fail to experience marked relief. In renal calculi and cystitis the benefits are usually decided.

Many cases of diabetes improve while taking these waters, while in some cases their use leads to a temporary or permanent cure. They are especially useful in gouty or fat diabetics. They are of little value in the grave form of the disease, as it occurs in young subjects.

These waters should be taken in moderation. Ordinarily from two to four glasses a day is sufficient. Marked catharsis should be avoided. If the warm water is found to have too little laxative or diuretic action, it should be allowed to cool before it is taken.

Exercise and diet are of importance in connection with the use of these waters and should be regulated by a competent physician. While exercise is essential, excessive exercise is not to be advised.

It is better to drink the water slowly. If it causes discomfort when taken on an empty stomach, a cup of coffee or beef tea may be taken half an hour before taking the water.

A careful diagnosis of every case should be made before the use of these waters is recommended. It is worse than useless to encourage a patient, who has malignant disease of the liver or digestive tract, to take a course of treatment at any of these mineral springs. By so doing he can gain no material benefit, and he may be losing the time during which radical surgical procedure would save his life.

ON THE USE AND ABUSE OF THE STOMACH TUBE

E. Palier, *New York Medical Journal* and *Philadelphia Medical Journal,* August 19, 1905.

This instrument was used for therapeutic purposes by Kussmaul in 1867, and for diagnostic purposes by Leube in 1871.

On account of the objections to its use made by some patients, it has been suggested that in these individuals it may be possible to obtain sufficient gastric contents by forced regurgitation on the part of the patient himself to satisfy in a measure the requirements of the physician. But it may be stated emphatically that this method will not satisfy our requirements. So much saliva and other mucous secretions are mixed with the gastric contents obtained by forced regurgitation that the result of their examination is absolutely valueless and utterly unreliable.

It is further claimed by those who are inclined to depreciate the value of the stomach tube that the acidity of the stomach may vary greatly even at short intervals. Where such observations have been made, they have probably been due to faulty methods, such as examining the stomach contents obtained by forced regurgitation. If correct methods are followed there will rarely, if ever, be seen a case which changes

from hypochlorhydria to hyperchlorhydria, or *vice versa,* within a short time.

Chronic gastric trouble cannot be scientifically treated unless the gastric contents are examined by an appropriate method. Cases of constipation and diarrhœa, where the patients allege there is nothing the matter with their stomachs, will frequently be found to be due to, or associated with, grave gastric affections, which need treatment. The symptoms given by the patients are absolutely unreliable, and the physical signs are in themselves never sufficient to corroborate a diagnosis. The examination of the gastric contents is absolutely necessary.

1. *Technique.* Soon after the stomach tube is introduced, especially when it is the patient's first experience, there is considerable retching and discharge of mucous and saliva, which run down partly through the lumen of the tube, and partly outside by the sides of it. When the gastric contents begin to flow they are greatly mixed with these alkaline or neutral discharges. In obtaining the first few c. c. of the gastric contents in a separate vessel, and a second sample again in another vessel, there is often found a great difference in the acidity of the two samples, the total as well as the hydrochloric acidity being different, the first, of course, lower, on account of the admixture of mucous and saliva.

Whenever possible three vessels should be used for obtaining the gastric contents for examination. The portion collected in the second vessel usually contains the highest acidity, and should be used for examination. The contents of the third vessel usually have a lower acidity than the second, because the secretion of mucous and saliva, which stops for a while after the introduction of the tube, increases again after the tube has been in for some time. The first portion should be preserved for a time, for one can never be sure, especially with a new patient, how much can be obtained. The splashing sound, *bruit de clapotage,* is occasionally deceptive, being sometimes observed where there is little or no liquid present in the stomach.

It is seldom necessary to aspirate to obtain the gastric contents. If a rubber tube be slipped upon the distal end of a glass tube, the proximal end of which is inserted into an Ewald stomach tube, by lowering the distal end, the stomach contents come out by the siphon principle, especially when some pressure is used on the stomach.

2. *Diagnosis.* If the stomach contents are obtained, in the way described, after an Ewald-Boas test meal, and that sample which contains more or less pure gastric contents, without much mixture of mucous and saliva, is taken as a standard, it will be found that the difference in acidity from one examination to another, within a short time, say two weeks, is never great. In most chronic affections of the grastro-intestinal tract a proper diagnosis is impossible without the stomach tube, and signs and symptoms are frequently only misleading. When one follows a good technique, as described, he will find that examinations at short intervals will give nearly similar results, so that one examination of the gastric contents is usually sufficient for diagnostic purposes.

3. The *contraindications* to introducing the stomach tube are really only few. When carefully and properly used, a soft rubber tube can do no harm.

In *cardiac affections,* in certain of which the patient is liable to die at any moment, even if he were to die during the introduction of the tube, it should not be blamed for the death. On the other hand the bad digestion and absorption, which are common in these cases, tend only to aggravate the cardiac trouble. The introduction of the stomach tube is therefore justifiable so that the nature of the gastric trouble may be determined, the proper diet prescribed,

and the faulty nutrition remedied.

In *aortic aneurism* it is prudent to avoid the risk of rupture, which, however, would be more likely to be caused by the excitement accompanying the introduction of the tube than by the tube itself.

In *hemorrhage from the stomach* the tube may do harm by aggravating the bleeding.

In *pregnancy* each case should be judged according to the individual circumstances.

4. *Therapeutic uses.* When the stomach cannot empty itself, when there is alimentary stasis, when, so to say, drainage is necessary, and also when there is much mucous in the stomach, the tube should be used. Whether the stomach should be "washed out" is a question on which observers differ. Boas and A. Matthews rarely do it, but simply empty the stomach. Others always "wash out" the stomach after it has been emptied by the tube. When there is an excess of bacteria in the stomach contents, with excessive fermentation and an abundance of mucous, washing the stomach with an appropriate lotion will usually be attended with better results than simply emptying it. This will also facilitate emptying the stomach when the mucous clogs and obstructs the tube. When the motility of the stomach is good, there is rarely an indication for the stomach tube as a therapeutic agent.

For diagnostic purposes this instrument is as essential in gastro-intestinal diseases as is the thermometer in general medicine, and when carefully used the former will do no more harm than the latter.

AEROTHERAPY

NÆVUS PILOSUS PIGMENTOSIS AND OTHER SKIN LESIONS TREATED WITH LIQUID AIR

William B. Trimble, *Medical Record,* July 8, 1905

Trimble reports experiments made in the clinic of Dr. Fox, at the New York Skin and Cancer Hospital, with liquid air. Naevi in his experience had been treated by electrolysis, caustics, injections of alcohol, excision, etc., with occasional cures, but nothing that seems to compare with the treatment by liquid air. This is simply ordinary air liquified, at 312 degrees below zero, boiling at ordinary temperatures, giving off fumes of nitrogen, slightly opalescent, very cool and dry. It boils away readily and is difficult of transportation, since it will explode if attempts are made to confine it. It is transported in a Dewar bulb, which is a glass bulb containing a small bulb within, the intervening space being exhausted of air. In applying the liquid air to the growth and skin, a pledget of cotton on the end of a stick is thoroughly saturated with the liquid, the excess shaken off and the application made, using a degree of pressure in accordance with the reaction desired. The application is made once a week.

Light pressure causes a slight reaction and inflammation. Medium pressure causes a superficial slough. Hard pressure will cause a deep slough. The first is suitable for lupus, the second for hairy moles, the third is sometimes employed in epithelioma. The application freezes the tissues extremely hard. A light application produces anæmia, followed by a localized congestion. Medium or hard pressure, an obliterating endarteritis with a consequent slough. Some scarring has followed in some

cases, but the results have been satisfactory and the cosmetic effect good. Little if any scarring occurs if the treatments are made frequently, but a slight degree of reaction is produced.

The liquid acts as a local anæsthetic, causing but slight tingling and burning. He considers that the applications have a marvelously fine effect on some of the chronic skin lesions. He reports a nævus situated on the upper eyelid, resembling the skin of a mouse, 1½ inches long and half an inch wide. Twelve applications of liquid air were made, some œdema of the eyelid followed, ulceration commenced, and after the fourth treatment healing took place under a scab, leaving a practically normal skin. In a similar case the application of liquid air caused considerable inflammation, but gave a fine result.

In a pigmented nævus three applications gave a smooth, white, scarcely noticeable scar. In a case of nævus vasculosus, close to the ear and still under treatment, quite a marked improvement has occurred. A case of epithelioma of the nose was apparently cured by two applications, another situated on the lower lip was cured with one application. A case of lupus erythematosus of the right cheek healed rapidly under four applications.

THE EMPLOYMENT OF DRY CUPS IN THE TREATMENT OF HERPES ZOSTER

Medwin Leale, *N. Y. Med. Jour.* and *Phila. Med. Jour.*, August 19, 1905.

Herpes zoster is not a skin disease, *per se*, but a nervous affection due to acute hemorrhagic inflammation of the posterior ganglia and trunks of the nerves supplying that portion of the skin on which the characteristic eruption is situated. It sometimes occurs without apparent, previously-existing, ætiology and sometimes in the course of various diseases as tabes, la grippe, malaria, etc. The herpetic eruption occurs along the course of the nerves emanating from the involved ganglia, appearing first as a rule, near the proximal emergence of the nerve and following its course towards its distal end. The pathological changes are manifested by hemorrhages, inflammation, and destruction of some of the ganglion cells, and those fibers of the nerve entering the spinal cord and running up into the posterior columns have been found to be degenerated.

Leale believes that counter-irritation over the affected nerve roots and trunk has been used too little in the treatment of this disease, and he recommends the use of dry cups for this purpose.

"The dry cups should be applied over the ganglia of the posterior roots and over the points of emergence of the nerves involved. In properly applying the cups it is necessary to have at least a general idea of the location and the relation of the spinal nerves, and the areas which they supply. In this connection it is well to remember that a ganglion is developed on the posterior root of each of the spinal nerves, and that they are situated in the intervertebral foramina external to the point where the nerves perforate the dura mater. This is the case with all the spinal ganglia, with the exception of the first and second cervical, the sacral, and coccygeal, which show slight variations in locations, which variations for all practical purposes in this connection can be disregarded.

"Having determined the location of the posterior root or roots involved, we are ready to proceed with the dry cupping. This is done just to the affected side of the spinous processes of the vertebræ over the area determined, several cups being applied and allowed to remain long enough to insure their maximum suction power. After the first set is removed, they can be reapplied if deemed necessary. Then we proceed to

applying a few cups to the location of the emergence and over the course of the nerve or nerves involved. In this we are guided by the seat of the pain and hyperæsthesia and by the location of the eruption. If the cups are applied carefully and over the areas accurately determined upon, we may expect in most cases a shortening of the duration of the disease and a great amelioration in the severity of the symptoms, and especially in the pain which in some cases has immediately and permanently disappeared. I make it a practice to cup early in the disease, in many cases before the eruption has appeared, when, of course, it is difficult or impossible to distinguish it from a simple neuralgia. I usually find it best to repeat the cupping once every 24 hours, and preferably just before the patient settles down for his night's sleep. In this way a nocturnal paroxysm of pain can often be prevented, and a good night's rest secured which otherwise would have been impossible."

Care should be taken not to rupture the vesicles, and the application of collodion is an excellent protective. If the vesicles *do* rupture a powder consisting of equal parts of pulverized oxide of zinc and starch and three per cent. powdered boric acid constitutes a very effective dressing. Over this powder should be applied a sterile cotton dressing held in place by a retention bandage. The treatment of underlying conditions, such as rheumatism, malaria, tuberculosis, etc., should be undertaken when these conditions exist.

HYDROTHERAPY

THE CONTINUOUS BATH

Friedrich Grosse, *Medical Brief*, July 1, 1905

The term "continuous full bath" is used to denote a procedure wherein the patient is immersed in water up to his neck, for hours, days, weeks, or even years, being taken out merely to attend to his physical necessities. The patient is usually laid upon rubber cushions or a sheet suspended around the brim of the tub, hence the term "hammock bath." The water is of necessity of a temperature very close to 97°, as it would otherwise be impossible for a warm-blooded animal to remain in it for such long periods, and because of this it does not materially change the body temperature of the patient when he remains in it from 15 to 20 minutes. Hebra was the first who used it for long periods, but since then it has been used by Riess and others in the treatment of manifold diseases. In some cases of skin diseases Hebra left his patients in the water for from two days to nine months, and after prolonged experimentation finally adopted the plan of leaving them in it just as long as the case appeared to require, even for years. No injurious results were ever observed. After four or five days uncomfortable swelling of the thick epidermis of the soles of the feet sometimes occurred and these swellings soon detached themselves, giving a little pain in the process, which was susceptible of elimination by simply pressing the soles against the rubber cushion. An itching, papulous eczema has sometimes appeared, which vanished, however, when inuncted with Ol. Rusci.

Hebra, junior, in 1877, reported upon 203 cases of various kinds of disease so treated, among them being 127 burns of the most serious kind, of which 71 cases died and 56 recovered. The effect upon burns was excellent in the way of relieving pain and avoiding infection of the wound, lymphangitis, pyemia, etc., suppuration was sparse, new skin rapidly

formed, and the scars were better than under other treatment. Nine cases of pemphigus vulgaris were cured and in six cases of foliaceous pemphigus life was prolonged and suffering materially alleviated. In one case of confluent smallpox, complicated by pneumonia, the five- to seventeen-day bath was applied; there was only moderate fever, the fever of suppuration was barely noticeable and the scars were good beyond expectation. Twenty-five gangrenous bubos out of 28 were healed, improvement appearing immediately after the treatment was inaugurated. Phagedenic chancres, phlegmon, gangrene of the skin and other conditions were included in this series and they were all serious cases. Riess reports remarkable improvement in cases of bed sores, which occurred on patients suffering from disease of the spinal cord, and further, made the unexpected discovery that the original disease underwent great improvement.

The various forms of meningitis, paralysis, delirium, and nervous agitation are stated to be amenable in some degree to the influence of the continuous bath, as well as obstinate sciatica and hysteria. Acute psychoses, epilepsy, and alcoholism have been treated with it by Kraepelin, Alzheimer, and Sander with good results. Maniacal excitement is said to respond to it with almost absolute certainty. In Beyer's Clinic of Mental Diseases at Hiedelberg the improvement was so marked that even the great increase in the work required did not make it necessary to increase the number of attendants; improvement in the patients' symptoms rendered the nursing easier for them. Perdijo has lately reported excellent results with it in tetanus and in typhus, typhoid fever, measles, scarlet fever, and erysipelas. Rose and Riess also report good results.

The physiological action of the neutral full bath is not understood sufficiently to render possible a satisfactory explanation of these benefits; that they occur, however, is testified to by a large number of the most trusted observers in the world. These benefits are summarized as follows:

First, it acts as a sedative upon the central nervous system.

Second, it influences circulation in the sense of disincumbering the inner organs and everts the blood toward the skin.

Third, it favors the nutrition of and healing processes in the skin.

Fourth, augments heat withdrawal greatly.

Fifth, accelerates metabolism.

In Grosse's opinion the vast clinical experience (thousands of cases have been treated) and experimental investigations available justify the assertion that "the continuous bath constitutes an exceedingly effective remedy which, though apparently troublesome to administer in some respects, justifies expectation of good success where other less laborious methods fail."

A THERAPEUTIC NOTE: COLD AFFUSION IN DELIRIUM TREMENS

Sir William Broadbent, *British Medical Journal,* July 1, 1905

Broadbent reports a case of delirium tremens to illustrate the gratifying efficiency of cold affusions in producing sleep, and describes the technique of their application as follows: "The patient is stripped naked and lies on a blanket over a waterproof sheet. A copious supply of ice-cold water in provided, and a large bath sponge dripping with the iced water is dashed violently on the face, neck, chest, and body as rapidly as possible. He is then rubbed dry with a rough towel, and the process is repeated a second and third time. The patient is now turned over, and the wet sponge is dashed on the back of the head and down the whole length of the spine two

or three times, vigorous friction with a bath towel being employed between the cold water attacks. By the time the patient is dried and made comfortable he will be fast asleep."

In the case reported opiates or sedatives were contra-indicated by the presence of a large amount of albumin in the urine, which gradually disappeared under the above treatment. Broadbent does not hesitate to carry it out even when extensive pneumonia accompanies the delirium tremens.

GASTRO-ENERITIS IN INFANTS

Dr. Gastonguay, *Bulletin Medical de Quebec,* July, 1905.

Among physical measures are mentioned lavage of the stomach or intestine, wet compresses and hot and cold baths. Gastric lavage has little to recommend it except in cases of acute indigestion. Once washing out the intestine may do good, but to repeat it every day is sure to weaken the child. For the stomach 100 to 150 cc. or for the intestine 1 or 2 liters of water are used. This should either be boiled or else contain 7 parts of salt to the 100 and the addition of a tablespoonful of peroxide of hydrogen is desirable. The temperature may be cool in cases of fever, or hot, 38°, 40°, and even 45° C. in hypothermia. Wet compresses, cloth wet with water at the temperature of the room, covered with oil silk and kept on day and night quiet the colic and the movements of the bowels.

Hot baths in algid cases, plunge the child for five minutes in water at a temperature of 38° C., adding some mustard during the last minute of the bath and using friction of the skin afterward. Cold baths for feverish cases. If the child's temperature rises above 38½° C., a bath at a temperature of 27° for 15 minutes every three hours. If the temperature is 40° or 41° C. the bath should be at 25° or 22° C.

In either case the prognosis is serious if the child does not respond to the baths by a reduction of fever in the one case, or by a warm glow in algid cases.

PROLONGED LAVAGE A PREVENTIVE OF ETHER-VOMITING AFTER OPERATION

George S. Brown, *Surgery, Gynecology, and Obstetrics,* August, 1905.

Vomiting which follows anæsthesia by ether is due to the irritant effect of the substance upon the wall of the stomach, to its direct influence upon the vomiting center in the brain, or perhaps both. As the ether is continually excreted by the stomach one washing would not be sufficient; the process would have to be repeated several times. This method of treating this form of vomiting was suggested by the fact that when poisonous doses of morphine were injected under the skin of dogs practically the whole amount injected can be removed by prolonged lavage of the stomach. Brown therefore has been applying this method of treating ether vomiting to all his cases for several years, and his results have been most gratifying. More than half of the cases do not vomit at all and the other half only vomit a few times, and Brown is confident that the reason these latter have vomited is because the washing was not kept up long enough because of the struggling of the patient or impatience of assistants.

The keynote to success in this method seems to be to carry it out thoroughly, that is, the lavage should be continued for half an hour or more, about three gallons of water will have to be used in injections of from a pint to a quart each time, and the patient should be allowed to drink all the water he wants to except in the case of an operation upon the stomach itself. When the patient drinks the water he usually vomits it up again once or twice, perfecting thereby the cleansing of the viscus.

PSYCHOTHERAPY

DIFFERENTIAL DIAGNOSIS OF EPILEPSY

Drs. Putnam and Waterman, *Boston Medical and Surgical Journal,* May 4, 1905

This article is excellent because in it the authors have viewed epilepsy not in a strict categorical sense, but rather as a disturbance of consciousness seen in different and varied modes. This disturbance in consciousness is characterized by a lowering of the level in these varied states ranging from a momentary lapse to a prolonged and deep state of that which is termed unconsciousness. Because these lapses are so varied in their depth and because the content of the lapsed, dissociated material is so different in its organization, they frankly state the impossibility at the present moment of differentiating epileptic states of certain kinds from other subconscious states presenting similar phenomena.

They cite numerous cases of epilepsy in which the period of unconsciousness or subconsciousness seemed of a high order of organization. In some of these cases by hypnoid measures the lost or lapsed content has been recovered, while in others it has been irrecoverable. While in all these cases the outward appearances were those of frank epilepsy yet it is thus shown that their real organization is widely different.

They rightly view epilepsy as insufficiently understood psychologically. There has been but little thorough work on analyses of these states in the true epileptic. Only by this work can these differential points be gathered which probably will point to the existence, in the epileptic, of states of marked disorganization at a low level.

The article is helpful chiefly because of its breadth of view attained by eliminating the less important and inconstant phenomena of this confusing malady.

PSYCHOPATHOLOGY OF SEXUAL PERVERSION

Dr. Donath, *Centralblatt für Nervenheilkunde,* March, 1905

The sole excuse for presenting this review is to display the biological view assumed by the writer. Those forms of perversion termed masochism characterized by great cruelty, bodily harm, cutting, tearing, etc., he approximates to the secondary sexual functions of the animal to whom, as is well known, these acts form the most important stimuli leading up to the focal act.

Implicitly he recognizes the possibility of the sexual life, by reason of its extreme lability, being liable to these reversions to the forms above mentioned, especially where the suggestions leading to such have occurred in early life, notably at puberty.

In this connection he reviews certain of the rougher plays of children which, by their striking, biting, tearing, touch the instinctive elements of the lower forms of sexual life. Such impressions may contain elements which, occurring at this period, persist as nuclei for future perversions, especially in neuro- and psycho-paths.

CLIMATOTHERAPY

TRANSACTIONS OF THE AMERICAN CLIMATOLOGICAL ASSOCIATION FOR 1904

The belated appearance of this volume is due, so we are informed, to the fact that it is published abroad where the pointer moves more deliberately than with us. Owing to the fact that a duty is now levied by our custom house on the sheets the work will hereafter be done in the United States.

The transactions for 1904 form a well-printed octavo volume of 292 pages. The body of the book is made up of 24 papers with the discussions. We observe that 14 papers are from the East, the remaining 10 being divided among the Western and Pacific states, the South, and Canada. Most of the papers are well written, and it is no exaggeration to say that they are instructive without exception. In the president's address he deplores the formation of some of the newer national associations, especially those for the study of tropical medicine, and tuberculosis, taking the ground that the object of both these bodies could be more effectually accomplished if their membership were consolidated with that of the American Climatological Association. Dr. S. E. Lally, in his brief paper makes a strong plea for the proper study of climatology in our medical schools, insisting that at least three lectures should be devoted to this subject during each college year, and that one or two questions should be embraced in the graduating examinations. One of the best papers is that of Dr. Wm. H. Flint on the climate of Santa Barbara, California. This excellent author shows the same discriminating acumen in sifting out and bringing forward important and useful facts which, the writer of this review loves to recall, characterized his early work as a hospital teacher in the metropolis. The present paper leaves little to be desired by those seeking accurate climatic knowledge of the favored Santa Barbara region. Dr. Carrol E. Edson's article entitled "A Meteorological Study of the Winter of 1903 and 1904" is highly practical and presents with startling force the importance of some knowledge of the vastly different weather and climatic conditions prevailing in different sections of the United States. The most hardened climatic skeptic could not fail to be impressed with the facts and figures presented by the author of this paper. The contribution on "Ocean Bathing" by Philip Marvel of Atlantic City is also of much practical value. The paper of Dr. Beverly Robinson on "Some Unsettled and Important Problems in the Treatment of Acute Lobar Pneumonia" is written in that talented author's best vein. No practitioner can read this article without feeling an increased ability to cope with that formidable malady.

No less than nine papers are devoted to the subject of pulmonary tuberculosis. All are worth reading and some of them are of a high degree of excellence, but lack of space forbids individual references. We shall call attention only to Dr. J. O. Cobb's contribution entitled "Is Milk a Factor in the Spread of Tuberculosis?" This paper shows the result of a vast amount of careful study and investigation in various parts of the globe. The conclusions would indicate that while the ingestion of bad milk may possibly be responsible for occasional cases of tuberculosis it can hardly be looked upon as a factor worthy of consideration in the grand statistical footings of the Great White Plague in its world-wide devastations.

BOOK REVIEW

STATIC, HIGH-FREQUENCY, RADIO, PHOTO, AND RADIUM THERAPY.

By William Harvey King, M.D., LL.D.
Boericke & Runyon, New York, 1905.

In this little volume of 290 pages, the author attempts to cover the above subjects. The subject matter is therefore very much condensed, but upon the whole it is readable, up to date, and free from error.

The chapter on electro-physics is so much condensed as to be valueless to the beginner. The short chapter of the Finsen light is devoted almost entirely to the discussion of the Finsen-Rheyn lamp, and full directions for the use and care of this lamp are given.

The static and high-frequency currents are considered at some length. An interesting discussion of X-ray burns is found in Chapter X, and it is the author's opinion that these burns will occur in the most careful hands, in spite of every effort and precaution. Chapter XIV is devoted to radium, and the apparatus of Mr. Leiber for employing emanations of radium is illustrated and fully described.

The author considers Finsen light as *the* treatment for lupus and states that the X-ray does not possess the same value. He has found epithelioma the least curable form of malignant growths, under X-ray treatment, carcinoma of the breast having proven far more amenable. His experience has been so unsatisfactory in epithelioma that he has no special technic to offer. He has discovered that when an epithelioma under treatment begins to show raised, hard, deformed edges and the surrounding tissue becomes infiltrated, the result of the treatment will be unsuccessful, and the case should be submitted at once to surgical or other measures. He speaks favorably of post-operative radiation, and ridicules the fluorescin treatment of Morton, doubting whether fluorescence actually takes place in the tissues. He reports some rather unusual results with radium in cancer of the tongue and believes that in the near future radium will prove much more successful in epithelioma than any other method of treatment.

In carcinoma of the breast the X-ray offers the greatest possibilities, and he does not consider that the surgeon has done justice to his patient, unless he advises the application of the ray immediately following operation.

Special Plates Illustrating

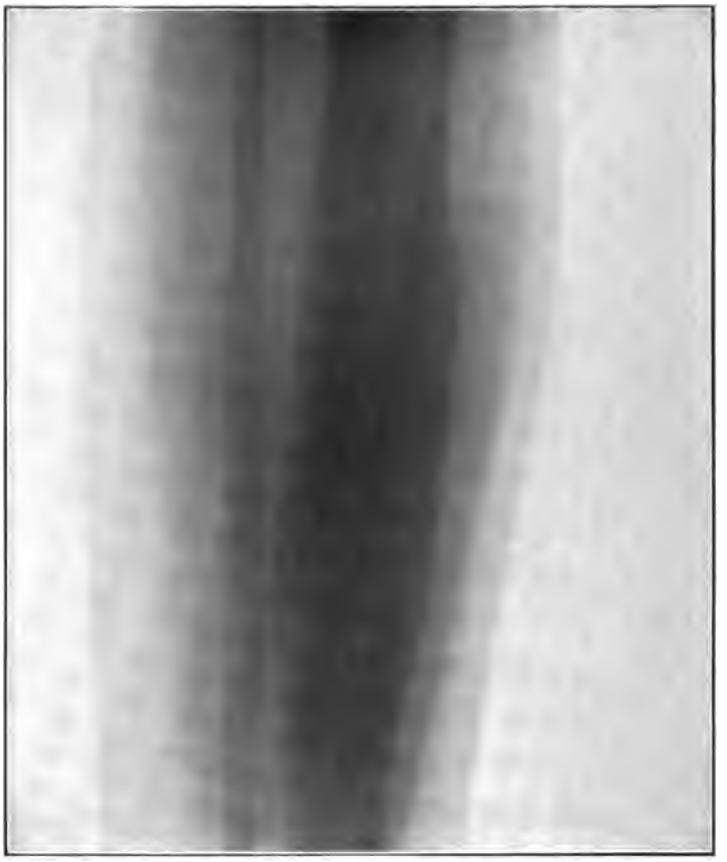
Osteoma and Osteomyelitis of the Tibia, and Os Trigonum Tarsi

Osteoma of Tibia; Lateral View.

Tumor was first noticed about three years ago, was tender and painful. A year later it was opened and a granular mass with considerable extravasation found and removed. The tumor soon recurred but gave little trouble until about 18 months ago when it was again operated upon and a bony mass removed. No pus was found at either operation and rapid healing followed both times. The growth again recurred and its present condition is shown by these roentgenographs.

Taken with a Wagner adjustable focus tube of four inches spark resistance, excited by a Wagner 8-plate static machine. Anode 15 inches from plate, exposure six minutes.

By Dr. W. H. Bean, New Haven, Connecticut.



Osteoma of Tibia; Antero-Posterior View of subject of Special Plate XLII.

By Dr. W. H. Bean, New Haven, Connecticut.

Osteomyelitis of Tibia.

Skiagraphed with 15-inch Carstarphen coil, Muller 8-inch tube 20 inches from plate, exposure 5 seconds.

By Dr. G. B. Stover, of Denver, Colorado.

Shows Os Trigonum Tarsi, a bone in the ankle of infrequent occurrence. Its presence has sometimes led to a diagnosis of fracture of the astragalus.

Skiagraphed with Kinraide alternating current coil, "K" tube, distance 15 inches, time 5 minutes, Cramer medium isochromatic plate.

By Dr. G. B. Stover, of Denver, Colorado.

Special Plate XLV.

THE ARCHIVES OF PHYSIOLOGICAL THERAPY

Devoted to the Diagnostic and Therapeutic Uses of Electricity, Radiant Energy, Heat, Water, Mechanical Vibration, Dietary Regulation, Exercise, Psychic Suggestion, etc.

VOLUME II No. V NOVEMBER 1905 WHOLE NUMBER IX

OBSERVATIONS ON THE INFLUENCE OF THE GENERAL DRY HOT AIR APPLICATION UPON THE BLOOD AND CIRCULATION *

BY WILLIAM WORTHINGTON HERRICK, B.A., M.D., OF NEW YORK CITY.

THE external application of heat is one of the oldest of therapeutical measures, temperatures up to 120° F. having been in common use since the time of Hippocrates. Within a few years however, invention and experiment have made possible the use of much higher temperatures until at the present time a treatment intensity of 400° F. is not unusual.

The field of usefulness of these high temperatures, restricted at first, has been gradually extended until their employment is now recommended in many varied conditions. In view of this more extended use a careful working out of the physiological action of these extreme high temperatures is desirable. It was with a view to making a contribution to such knowledge that the investigations, a report of which follows, were undertaken.

The points investigated were as follows:

I. The Heart; influence upon its action, force, frequency, etc.

II. Peripheral Circulation; influence upon (a) pulse, (b) blood pressure, (c) capillary circulation.

III. The Blood; influence upon (a) leucocytes, (b) erythrocytes.

The subjects of these observations were patients undergoing treatment in which the Betz body dry hot air apparatus was used. The temperatures to which they were subjected varied from 350° to 400° F., and the duration of the application was from twenty to thirty-five minutes. So far as possible data and results have been tabulated in the accompanying chart to which reference should be made.

* *Thesis presented at the Yale Medical School for the degree of M.D., June, 1905.*

TABLE ILLUSTRATING "OBSERVATIONS ON THE INFLUENCE OF THE GENERAL DRY HOT AIR APPLICATION UPON THE BLOOD AND CIRCULATION."—*Herrick.*

Case No.	Character of Case	Date	Duration of Application	Degree of Heat Applied	Time of Observation	Pulse	Mouth Temperature	Leucocytes	Polymorphonuclears	Small Lymphocytes	Large Lymphocytes	Eosinophiles	Basophiles	Erythrocytes.	Loss in Body Weight
I	General debility from over-work — Woman, 20 years old	Dec. 20, '04	33 minutes	380° Fah.	Before treatment	76	98.2° Fah.	8,200	55.0%	37.0%	6.0%	1.0%	0.5%	3,340,000	Not ascertained
					After "	108	100 0° "	14,200	62.0%	28.0%	8.0%	1.0%	0.5%	3,312,000	
II	Normal health — Man, 37 years old	Dec. 21, '04	35 minutes	350° Fah.	Before treatment	84	98.2° Fah	6,000	57.0%	27.0%	15.5%	1.0%	0.5%	5,440,000	40 ounces
					After "	118	100.0° "	10,800	59.0%	32.0%	7.5%	0.5%	1.0%	5,120,000	
III	Excessive nervous irritability following Hysterectomy and Ovariotomy — Woman, 33 years old	Dec. 22, '04	35 minutes	375° Fah.	Before treatment	74	98.0° Fah.	5,500	*	*	*	*	*	4,385,000	12 ounces
					After "	120	99 8° "	7,000						5,188,000	
IV	Chronic Neurasthenia of indefinite causation — Woman, 32 years old	Dec. 22, '04	35 minntes	380° Fah.	Before treatment	68	98.0° Fah.	10,800	61.5%	30.5%	7.5%	0.5%	0.0%	4,864,000	16 ounces
					After "	92	100.2° "	8,800	68.0%	29.0%	3.0%	0.0%	0.0%	4,776,000	
V	Normal health — Woman, 38 years old	Dec. 26, '04	30 minutes	375° Fah.	Before treatment	70	97.6° Fah,	8,400	64.0%	29.0%	5.0%	1.0%	0.0%	4,368,000	20 ounces
					After "	112	100 0° "	8,550	72.0%	21.0%	5.0%	0.0%	0.0%	4,884,000	
VI	Neuritis of right cervical plexus and musculo-spiral nerve — Man, 52 years old	Dec. 24, '04	35 minutes	375° Fah.	Before treatment	68	97.0° Fah.	8,000	57.5%	34.5%	6 0%	0.5%	1.0%	5,056,000	Not ascertained
					After "	92	99.4° "	7,000	55.0%	40.0%	3.5%	0.5%	1.0%	5,021,000	
VII	La Grippe — Woman, 35 years old	Dec. 27, '04	35 minutes	390° Fah.	Before treatment	76	98.0° Fah.	9,000	64.5%	31.0%	3.0%	1.0%	0.5%	4,164,000	16 ounces
					After "	106	100.0° "	7,600	56.0%	40.0%	3.0%	1.0%	0.0%	4,000,000	
VIII	Mild arthritis deformans — Woman, 44 years old	Apr. 24, '05	30 minutes	385° Fah.	Before treatment	88	97.6° Fah.	8,600	*	*	*	*	*	Not counted	Not ascertained
					After "	108	99.2° "	10,000							
					12 hrs. after "	....	.....	8,600							
IX	La Grippe — Woman, 32 years old	Apr. 28, '05	30 minutes	400° Fah.	Before treatment	70	97.6° Fah.	16,000	*	*	*	*	*	Not counted	Not ascertained
					After "	112	99.6° "	11,400							
					12 hrs. after "	..	.....	6,200							
X	Mild arthritis deformans — Woman, 44 years old	Apr. 17, '05	35 minutes	395° Fah.	Before treatment	90	98.2° Fah.	Not counted	64.0%	33.0%	3.0%	0.0%	0.0%	Not counted	Not ascertained
					After "	106	100 2° "		56 0%	40.0%	3.0%	0.5%	0.5%		
XI	General debility from over-work — Woman, 20 years old	Dec. 26, '04	30 minutes	370° Fah.	Before treatment	74	98.4° Fah.	11,000	69.0%	27.0%	3 0%	0.5%	0.5%	4,672,000	24 ounces
					After "	108	100.2° "	11,200	67.0%	30.0%	2.0%	1.0%	0.0%	4,992,000	
XII	Acute articular rheumatism — Man, 46 years old	May 10, '05	38 minutes	400° Fah.	Before treatment	82	98 2° Fah.	12,200	61.5%	30.5%	6.5%	1.0%	1.0%	Not counted	Not ascertained
					After "	112	100.0° "	9,600	66.5%	22.5%	8.5%	1.5%	1.0%		
XIII	Moderately severe arthritis deformans — Man, 23 years old	May 3, '05	20 minutes	390° Fah.	Before treatment	88	98.8° Fah.	14,000	66.0%	28.0%	4.0%	1.0%	1.0%	Not counted	Not ascertained
					After "	108	99 6° "	17,100	65.0%	30.0%	3.0%	1.0%	1.0%		

* Differential count not made.

THE HEART.

The effect upon this organ is essentially stimulant. There is more forcible systole and an increase of from twenty to fifty beats per minute. More blood than normal is pumped at each contraction as is shown by the character of the pulse; and this, with the acceleration, produces markedly increased cardiac efficiency. This increased force continues to be evident for from four to twenty-four hours after the conclusion of the treatment; the increase in frequency from one to four hours after.

PERIPHERAL CIRCULATION.

The Pulse.

This is accelerated in rate, increased in volume, and becomes more forcible, tension rising from ten to twenty millimeters of mercury; as treatment is continued there is further acceleration while the force remains for a time unchanged. If the extreme high temperature is maintained further, however, the pulse becomes more rapid and weaker yet may still retain its volume, while tension falls to normal or somewhat below.

Analysis of the results of one hundred treatments has shown that an average acceleration of twenty-five beats per minute takes place, while the mouth temperature was raised to 2° F. After the conclusion of the treatment the pulse rate returns to normal within one or two hours, but the increase of volume is maintained for from four to twenty-four hours.

Blood Pressure.

The effect upon blood pressure was investigated by means of a modified Janeway apparatus and the findings led to the following conclusions; first, that high temperatures tend only slightly to raise the blood pressure, and this only in the early stages of the application and despite the appreciable acceleration of the pulse; second, that in the late stages of the treatment the blood pressure tends to fall. The variation in either case was slight, only from ten to twenty millimeters of mercury.

A careful study of the conditions of the pulse throughout the application bore out the results of instrumental findings.

The Capillaries.

Observation of a patient whose body, from thorax to feet, is being subjected to dry heat at a temperature of 350° to 400° F., shows marked dilatation of skin capillaries, not alone in the area exposed to the heat but as well in the face and other parts without the apparatus. The face and the entire body surface are flushed. The dilatation does not vanish at once but often persists for several (one to twelve) hours after treatment.

THE BLOOD.

My chief effort in this work has been directed toward ascertaining whether or not there was any definite effect upon the corpuscular constituents of the blood.

Leucocytes.

The results achieved by some observers in the treatment of septic infection and diseases in which a leucocytosis is present led me to fancy that some definite effect upon leucocytosis might be noted.

The appended chart shows that, of the twelve cases in which a count of the leucocytes was made immediately before, and again when the pulse and temperature had returned to normal after the treatment, in none was there any very considerable variation. Seven show an increase, for the most part slight and within the limits of error; one shows an increase of 6000, another an increase of 4800, and a third an increase of 3100; in all the rest the increase was below 2000. Five show a slight decrease of leucocytes, the one case (No. IX.) in which there was a leucocytosis (before treatment) that could reasonably be adjudged pathological, showing a decrease of 4600, the rest of a decrease of 2600 or less.

Considering the data as a whole one may conclude that slight increase in the leucocytes is the rule but this increase is so slight that the therapeutic results attainable in septic infection, etc., are more than probably due to some other element of the physiological action.

No blood examination being complete without the differential count, I made such upon ten cases that I might observe the effect upon the relative number of leucocytes. Four hundred cells were counted in each instance, but the mechanical stage was not used. Reference to the chart is the simplest way of stating the results which were, in the main, negative.

Erythrocytes.

In eight cases count of the red blood cells was made before and after the treatment and in five instances a decrease in their number demonstrated. This decrease amounted to 320,000 in one case, to 164,000 in a second and in the three remaining to 88,000, 38,000, and 35,000, respectively.

Three cases showed an increase of the erythrocytes, in one (Case III), of 803,000, while Cases V and XI showed an increase of 516,000 and 320,000 respectively.

The finding, in five cases, of a decrease that was slight, and in three cases of an increase of some moment, renders impossible any general conclusion other than that the effect upon the erythrocytes in either direction, decrease or increase, is slight.

William Bain, Wilfrid Edgecombe, and Herbert Frankling writing in the "London Lancet" of April 29, 1905, upon "The Effect of Certain Baths and Forms of Electricity on the Blood, Blood Pressure, and Metabolism" record the results of careful experimentation upon the physiological effects of dry hot air applications, undertaken at the Harrowgate Infirmary, as follows:

Superheated air baths (Greville system) at 300° F. for thirty minutes produced a fall of blood pressure of thirty-five mm., an immediate diminution in the number of red corpuscles followed in half an hour by an increase, and a marked increase in the hemoglobin value of each corpuscle.

Patients treated in the radiant superheated air bath (Dowsing system) at a temperature of 280° F., for thirty minutes bore the application less comfortably than the 300° F. in the Greville (non-luminous) system, blood pressure fell fifty millimeters as compared with thirty-five millimeters under the non-luminous application, red blood cells were temporarily decreased followed by an increase later, and there was marked reduction of hemoglobin value.

My own observations show that a temperature of 350° to 400° F. continued for from twenty to thirty minutes causes slight alteration in blood pressure and almost none in the number of red corpuscles. It may, therefore, be suggested that a temperature of 300° F. and below, in prolonged application, is depressant, one of 180° F. (radiant heat) being more pronouncedly so than one of 300° F. (non-luminous). Temperatures of 350° F. (non-luminous) and above act, on the contrary, as a stimulant to the heart and circulation and produce less change in the number of red corpuscles.

It has not been my purpose to deal with the therapeutic uses of this agent, but the following facts may be deduced from the above data and may profitably be brought to notice.

First, dry heat is a powerful and effective heart stimulant. The force and frequency of the heat are increased and the rate of blood flow greatly accelerated; and that without any very considerable rise of blood pressure. The effects here are comparable with those of alcohol.

Second, it is the most powerful means known by which to effect dilatation of

the surface capillaries and thus to relieve congestion of internal organs.

A therapeutic measure which, without raising the blood pressure appreciably, causes increased force and frequency of the heart beat, fuller arteries, accelerated blood flow, with dilatation of the surface capillaries and without subsequent depression or other deleterious effect, is distinctly of value. In conditions showing weak heart action, weak pulse, cold, clammy skin, in short states of circulatory depression, as shock or toxaëmia, general dry, superheated air applications (non-luminous) seem theoretically to meet all indications and to meet them more completely than any other one agent.

ANTE- AND POST-OPERATIVE TREATMENT OF CANCER OF THE BREAST *

BY GEORGE C. JOHNSTON, M.D., OF PITTSBURG, PENNSYLVANIA.

Lecturer on Radiotherapy and Electro-Physics Western Pennsylvania Medical College, Pittsburg, Pa.; Radiographer to St. John's General Hospital, Allegheny, Pa.; etc.

THE findings of various pathologists agree closely upon the changes taking place in carcinomatous tissue when exposed to therapeutic doses of Roentgen rays, and by the interpretation of their reports, good and sufficient reasons for ante- and post-operative radiation are afforded.

These changes consist of a breaking down of the islands of carcinomatous cells, beginning and most pronounced in the rapidly growing periphery. The neuclei are broken up, the cell walls broken or ill-defined. A peculiar endarteritis of an obliterating type has attacked the blood vessels and the vessels are surrounded by masses of small cells. This degeneration is apparent even in the deepest portion of the tumor.

Later sections show a replacement of the carcinomatous masses by simple connective tissue. This degeneration is not a result in all probability of the endarteritis since it is often observed before the endarteritis is manifested. It is more likely the result of the response of the individual cells to the peculiar irritation caused by the ray itself.

The response of the cells to the irritation is first a stimulation of activity, then over-stimulation followed by destruction. The cells are affected in the order of their physiologic activity, and specialization. Were the cause to act for a sufficient time with a sufficient intensity even the normal tissues would suffer, but in carcinoma it is happily the ingrowing epithelial nests with their rapid proliferation and heightened activity that suffer first. A differentiation is thus made possible.

A dosage can be formulated and administered potent enough to destroy the pathological tissue, yet sparing the normal. Moreover, by the continued application, the resulting endarteritis cuts

* *Read at the Sixth Annual Meeting of the American Roentgen Ray Society, at Baltimore, Maryland, September* 28-30, 1905.

down the blood supply upon which the anarchistic career of any neoplasm is directly dependent.

In addition to this well-defined change in the tumors and the blood-vessels, there is found a peculiar action manifested upon the lymphatics, both vessels and glands.

The vessels are, so to speak, sclerosed. The glands themselves are small, hard, fibroid masses bearing but little resemblance to glandular tissue. This condition is shown not only in carcinomatous glandular involvement, which has been subjected to Roentgen rays, but also in tubercular adenitis.

It therefore appears that in a case of carcinoma of the breast the application of the Roentgen ray, of sufficient intensity, for sufficient time, is capable of causing a disappearance of the tumor and disappearance of the carcinomatous cell nests, their replacement by normal connective tissues, a proliferative obliterative endarteritis, and a sclerosis of the lymphatics, vessels and glands, leading from the affected part.

If this be true and a multitude of observers concur in their findings, we possess in this radiation, an agent which fulfills every indication to be desired in the treatment of this disease, if there were *no other factor to be considered. Yet in truth the use of the ray alone in the treatment of carcinoma is justified in but few cases and the main stay remains as of old in careful complete surgical extirpation in operable cases.*

Since the experience of years has demonstrated however, that operation alone, even in apparently favorable cases, is not followed by a percentage of successful results that can be complacently reviewed, it seems to me good surgery and good sense to combine with operation, an agent which has demonstrated for itself a directly selective, destructive affinity for carcinoma wherever situated.

It is admitted that carcinoma spreads through the lymphatics. When metastasis occurs this is the path through which the infection, so to speak, has traveled. It has been observed by not a few men, that some cases show a metastasis so quickly following operation where the lymphatic system has been considerably disturbed as to give rise to a suspicion of cause and effect.

It seems to be plausible that in an operation for carcinoma, with extensive dissection and large wound surface, with thousands of gaping lymphatics covered during the manipulation necessary with carcinomatous debris, it is quite possible that infection should occur under such conditions. If before the operation these lymphatics and glands had been practically obliterated by a course of ante-operative radiation this dangerous contingency should be avoided. Moreover, since it has been proven that such radiation has the power of directly influencing the vitality of the cells in the order of their physiologic activity, such carcinomatous material as might find its way into the open lymphatics might be assumed to be of a lower vitality and less dangerous, therefore, than it would have been had the ante-operative radiation been omitted.

The objection to the ante-operative radiation that has been advanced by many surgeons is, that it interferes directly with the healing of the operative wound which sometimes shows a tendency to become gangrenous. This is only the case when a decided overdose, sufficient to markedly impair the vitality of the tissues forming the flaps has been administered. Such an amount of radiation is neither desirable nor necessary, since the effect upon the carcinomatous tissue and the lymphatic system should be manifested long before the vitality of the healthy tissue is impaired.

A course of radiation not to exceed 10 treatments of 20 minutes each, at a tube distance of 18 inches, is sufficient in the majority of cases to accomplish the desired prophylactic result. A tube of

fairly low vacuum should be employed carrying a current not to exceed 2½ milliamperes. This should not be followed by any considerable degree of dermatitis, and in my experience, the healing of the wound is all that could be desired. Following the operation on about the 15th day, a series of post-operative radiations should be begun. The reason for this is evident, since an operator no matter how skilful and experienced he may be, can never be certain, that in his operation he has succeeded in removing every vestige of carcinomatous tissue, every infected lymphatic gland and trunk. Unless this has been successfully and completely accomplished recurrence must be expected. Since this happy result is very seldom obtained, and since we have in the X-ray, an agent capable of determining exactly between healthy and carcinomatous tissue and also capable of destroying such affected tissue, while yet sparing the surrounding healthy tissue, what good reason is there to advance against the routine employment of this agent as a prophylactic against recurrence in conjunction with operation for carcinoma wherever and however situated?

The ideal of surgery is asepsis, yet many good surgeons prefer the use of a little antisepsis in addition. The aim of surgery in operations for carcinoma is to remove the disease in its entirety, but I believe a little Roentgen ray "antisepsis" against recurrence is advisable as well.

Post-operative radiation properly applied can do no harm. Improperly applied, it can do harm by interfering with the healing of the parts and might even produce a dangerous dermatitis, but it is not to be decried on this account. Just so might an intravenous injection of bichloride solution be administered to an exsanguinated patient by a careless nurse in place of a normal salt solution, but the bichloride will not be barred from the operating room even though this may happen; the nurse however, should be promptly barred from the room forever. So in case post-operative radiation produces unpleasant results, the best remedy is to procure an operator possessing sufficient judgment and experience to justify a surgeon in entrusting this most important part of the treatment to his hands.

Nurses, orderlies, engineers, and resident physicians are usually much more competent to operate on these cases than to ray them, although the former proceeding would not be tolerated for a moment. I believe that a careful investigation of this practice and its adoption as a routine measure following operation for malignancy in the breast will result in a remarkable change in the statistics of this disease. Moreover, a familiarity on the part of the surgeon with the actual power of this agent in controlling carcinoma will result in a change in the classification of these cases; we will hear less of "inoperable" carcinoma of the breast.

Many cases that are now looked upon as hopeless, and in which surgical interference is considered unjustifiable, will be submitted to surgical measures with a fair expectation of permanent relief. Under the method mentioned above, cases of extensive carcinoma may be taken in charge, rayed, operated upon, and by a continued post-operative treatment freed from carcinoma. To do such work successfully requires the hearty intelligent co-operation of the surgeon and the radiologist. Working together with a full knowledge of the limitations of their art much can be accomplished. In such cases two important factors must be constantly borne in mind; first, the X-ray must not break down more tissue than the patient can successfully eliminate. Second, the knife must not remove more tissue than is absolutely necessary. No attempt need be made to perform extirpation of all infected tissue since, if the case be inoperable under ordinary circumstances this would be impossible. The operator should aim at removing as

large a quantity of carcinoma as is consistent with safety to the patient, yet hemorrhage and shock must be carefully avoided since the patient will require strength and blood to carry her through post-operative treatments.

Large, plethoric, fat patients, even with enormous carcinomas and extensive operations do better than smaller, thin and anemic patients. They have more resistance and the progress of the disease is usually slower. By this method then, it is possible to bring within the range of hope, a class of cases which under ordinary methods of treatment are among the most pitiable with which the surgeon has to deal. A large percentage of successful results need not be expected and will not be obtained, but failure should only stimulate repeated endeavors. The salvation of one ordinarily hopeless case is a greater victory than a long series of successful results in ordinary primary cases.

That class of operators who are easily discouraged by failure, who in other walks of life would be known as "quitters" are not advised to undertake the treatment of this class of cases, but those men to whom a single success is a constant spur and repeated failure but an incentive to renewed endeavor can undertake this work with a fair expectancy of success.

I will report in this connection a single case illustrating the technic employed, and the class of cases described.

Miss A—. Referred by Dr. Stevenson, of Pittsburg. Aged 60. Weight 185. Large carcinoma of the breast with axillary and supra-clavicular glands involved. Carcinomatous nodules above the clavicle and studded over the other breast along the sternum and posteriorly over the scapulae. Halstead operation by Dr. Langfitt, after a preliminary series of ante-operative radiations extending over two weeks. So much tissue was involved and removed that no attempt was made to approximate the edges of the wound but an area 6 x 8 inches exposing the chest well was left uncovered by flaps. On the 15th day following the operation which was accomplished with but little hemorrhage and shock, radiation was begun, exposures being made directly over the wound through the dressings, under the arm and to the back. The length of exposure was 10 minutes in each location, 30 minutes in all, treatments being given every other day. Granulations begun promptly and in two months the large open wound had entirely closed.

A few small carcinomatous nodules appeared *during treatment* over the front and back of the chest, but upon being sufficiently attacked disappeared. Recovery was uneventful, and the patient remains in perfect health at the present writing, almost two years having elapsed. This case was inoperable from a surgical standpoint and from the extent of the metastasis might have been considered hopeless, yet she remains today in perfect health.

An attempt to treat such a case without surgical assistance would have simply resulted in overwhelming the patient with the broken down carcinoma and an auto-intoxication would have caused her death.

It is the hope of the writer that this short paper may bring out a discussion of this subject which will result in a better understanding and a different viewpoint of this question for both the surgeon and the radiologist. I believe that the best interests of a most unfortunate class, the sufferers from cancer of the breast, demand a careful investigation of the truth or fallacy of the statements expressed, which represent the belief of the writer founded upon a study of this method during the past four years.

Discussion.

Dr. J. Rudis-Jicinsky (Cedar Rapids, Iowa,) always rays his cases of carcinoma both before and after operation.

Dr. H. K. PANCOAST (Philadelphia,) considers pre-operative treatment proper in all cases, and post-operative treatment he regards as the only chance the patient has of getting well. Cases of carcinoma of the breast have but a slight chance of recovery if there is a decided metastasis in the mediastinum.

Dr. GEO. E. PFAHLER (Philadelphia) did not agree with Dr. Pancoast as to the hopelessness of mediastinal metastasis. He has treated six such cases, and three are to all appearances perfectly well.

A ROENTGEN RAY FILTER, AND A UNIVERSAL DIAPHRAGM AND PROTECTING SCREEN *

BY G. E. PFAHLER, M.D., OF PHILADELPHIA, PENNSYLVANIA.

Director of the X-Ray Laboratory of the Medico-Chirurgical Hospital.

1. *The Universal Diaphragm, and Protecting Screen.*

MY first report upon this protecting screen for the patient was made in the Philadelphia Medical Journal, February 14, 1903. The improvements made in the screen and the much wider field of usefulness I believe justify a second report and demonstration before this honorable body.

At the time of the first report, the only serious danger from X-ray exposures especially during treatment seemed to be to the patient. Since then a much more grave and dangerous effect of the ray has been demonstrated as affecting the operator. The need of more protection to the patient against the stray and distant rays has also been demonstrated. The original circular disk of lead, which is 15 inches in diameter, when placed beneath the tube and close to it, cuts off all of the rays which are directed downward, but gives no protection to the parts of the patient which are from three to five feet away from the tube, and gives none to the operator. Long continued exposure to the stray and direct rays even at considerable distance from the tube have an undoubted serious effect upon the operator. We must therefore adopt every means possible for our protection. The simple addition of side shields I believe gives this needed protection to both the patient and the operator.

The original design consisted of a lead disk 18 inches in diameter, with a central opening of five inches, covered by variable diaphragms. This disk is then attached to a heavy iron stand which allows any needed change in height, angle, or position of the diaphragms. To this primary device is now added either one or two side shields of lead as shown in the illustration. These are attached by an ordinary spring clamp, and can be moved about the edge of the disk so as not to interfere with the wires leading to the tube, and yet so as to give protection to the patient and the operator. They are made four inches in height so as to cover the antikathode, and yet allow a part of the hemisphere of phosphorescence to be visible.

An equally valuable use of this adjustable diaphragm is its application in the "diaphragm technique." The value of

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* *Read at the Sixth Annual Meeting of the American Roentgen Ray Society, at Baltimore, Md., September* 28-30, 1905.

this technique, which has been so highly lauded by our German colleagues and which has been so ably demonstrated by our own Dr. Hulst, needs no comment from me. Last year I was slow to believe that it was of any great advantage, or at least I did not believe that it was worth the trouble. Since then I have been thoroughly convinced of its value. Now I seldom make a radiograph without using the diaphragm, set at a distance of 15 inches. The chief objection last year was the cumbersome apparatus required and the time consumed in its manipulation.

The diaphragm here described is simple, inexpensive, and easy to manipulate. As a rule I use a two inch opening, set at a distance of 15 inches from the plate, with the antikathode 4 inches from the diaphragm. This will just cover nicely the central part of an 8x10 plate. The diaphragm is easily placed in any position and can be graded to any size,—the smaller the opening, the sharper the detail.

This diaphragm has also the advantage of being adaptable to fluoroscopic examinations, because it can easily be turned to a vertical position, and the size of the opening can be instantly varied to suit the part under examination. The use of the diaphragm in fluoroscopic examinations confers two distinct advantages. In the first place, it gives better detail; second, it protects the patient and the operator against the rays excepting in the radiated field under examination. The dangers from this field can be partly avoided by the use of a protecting fluoroscope, which will protect the head and eyes of the operator.

A protecting fluoroscope is made by lining the slanting sides of the box with thin sheet lead, and by placing a small piece of lead glass at the opening nearest the eyes. I had thought this was a new idea of mine, but I find it described fully by Rollins in his book, "Notes on X-Light."

If to this equipment is added the opague gloves and apron of Dr. Price, I believe we are safe in making fluoroscopic examinations.

2. *A Roentgen-Ray Filter.*

Roentgen in his third communication (quoted by Walter, Fortschritte a. d. Gebiete d. Roentgenstrahlen, Vol. VIII., p. 297) stated that the X-ray is composed of rays of different quality, and showed that after the rays had passed through a layer of aluminum, staniol, or glass, the second layer of either of these substances studied, of like thickness, absorbed very much less of the rays than were absorbed by the first layer. In other words there was a greater percentage of hard rays present after than before passing through these substances.

Walter has continued the investigations along this line. (Fortschritte a. d. Gebiete d. Roentgenstrahlen, Vol. VIII., p. 297-303.) He has demonstrated that not only is the above law correct, but that all substances have respectively a selective absorbing power for the rays, in a similar manner to that in which the rays of the sun are absorbed by various kinds of glass which absorb certain rays but allow others to pass through. He found that this selective power is closely related to the atomic weight. This might be expected, but contrary to our former ideas he has found that this absorptive power does not increase directly with the atomic weight.

In his experiments he used the various metals and found that the metals whose atomic weights are found at the extreme ends of the scale of atomic weights, either low or high, select and absorb the soft rays, while the metals arranged in the middle of the scale of atomic weights absorb the hard rays.

To the group of metals absorbing the soft rays belong the majority of the metals, such as aluminium, iron, copper, zinc, platinum, lead, etc. On the contrary, silver allows the soft rays to pass

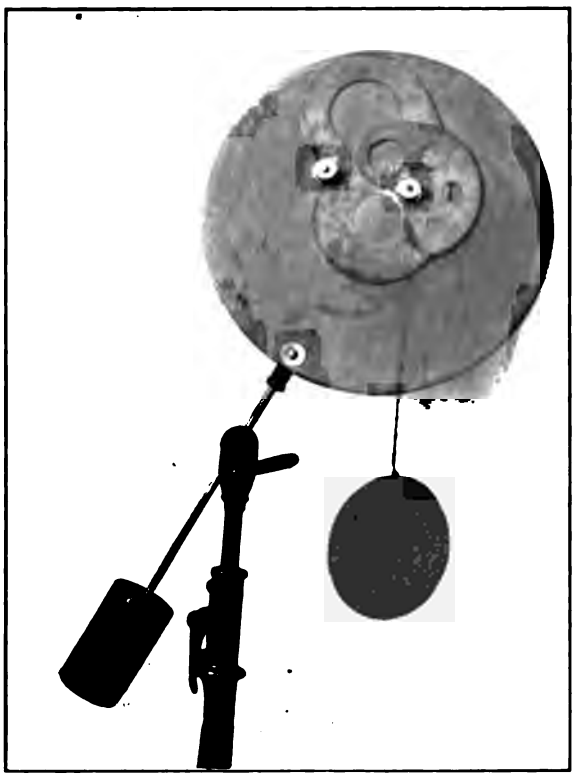

Figure I.

Upright position of Filter used in fluoroscopic examination. The leather used in filtering out the rays which affect the skin is suspended by a cord, as shown in the photograph.

Illustrating A Roentgen Ray Filter, and a Universal Diaphragm and Protecting Screen — *Pfahler.*

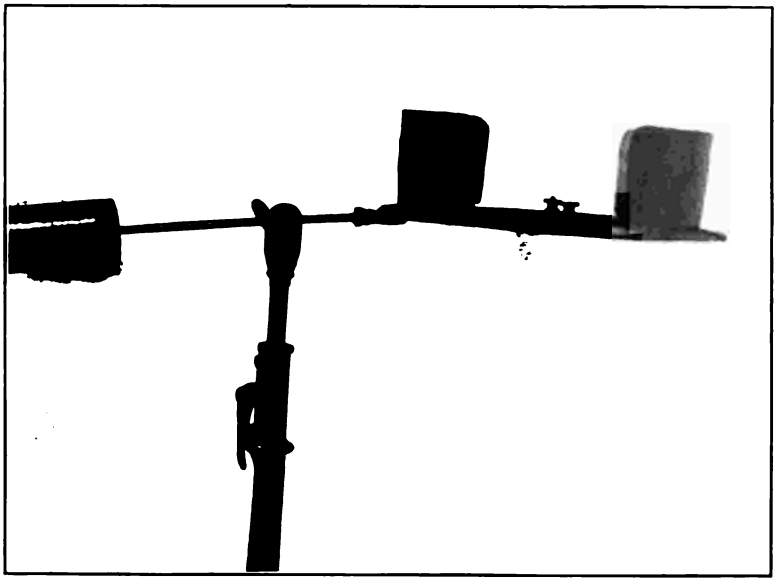

Figure II.

Horizontal position, as used in treatment and examination. The shields are shown at the side, held in place by a clamp.

Illustrating A Roentgen Ray Filter, and a Universal Diaphragm and Protecting Screen — *Pfahler.*

through, and absorbs the hard rays. To this group belong also the metals which are closely related to silver in atomic weights, as palladium, cadmium, tin, and antimony.

Recognizing the above two physical laws regarding the Roentgen ray, namely that each substance has a definite and peculiar absorbing power for the rays, and that the rays which have once passed through a substance, are not likely to be absorbed by a second layer of the same substance, I decided to make practical clinical application of these two principles. These applications can be made both in radiotherapy and in radiography.

In radiotherapy, the rays which give us most concern are those that affect the skin when we are treating deep-seated disease. If the law of selective absorption be correct, then the skin has a peculiar absorbing power. Now, I reasoned that in order to filter out these harmful rays we must select a substance that resembles the skin as closely as possible. The substance resembling the skin most closely is leather. In order to make assurance doubly sure I have selected the thickest leather possible, namely, sole-leather, which is about four times as thick as the human skin. Therefore the rays which pass through this leather should pass through the skin without affecting it in any way, according to the other law.

Based upon this theory, during the past four months I have made use of this "Roentgen Ray Filter" with the most gratifying results. During the first six weeks, in order that I might be able to draw correct conclusions, I used the same amount of current with the tube at the same distance as in my work previously. As a result, I obtained no redness and no tanning at any time. Previous to the use of this "Filter" I obtained both redness and tanning from the same amount of exposure. During the past ten weeks, I have increased the amount of current and lessened the distance. Still I have not obtained the usual redness nor tanning.

In one case which has been under regular treatment for Hodgkin's disease for six months, and which had been tanned dark, the tanned skin desquamated and was not renewed although the amount of exposure was increased.

In another case which I have been treating for a year for round-celled sarcoma of the ethmoid cells, and whose face had been reddened many times, and who was so sensitive to the rays that she noticed a burning sensation each time the rays were applied previously, did not notice this burning sensation when the leather was used. Since the use of this "Filter" the amount of exposure has been increased and no redness produced.

In another case of osteo-sarcoma involving the metacarpal bones, daily exposures have been made. By mistake, the stray rays at times struck his face, because he was in a sitting position. The face was twice as far away as the hand. A severe erythema developed upon the face, while upon the hand, which had been exposed to the direct rays at shorter range and constantly, but the rays having passed through this "Filter," *no redness has been produced.*

In another case, a burn of the first degree had been produced during the treatment of mediastinal carcinoma. After two months, the redness and papules, and a small ulcer had not completely healed. Further treatment was necessary. Treatment was given through the "Roentgen Ray Filter." The burn healed, and although the amount of exposure has been increased, no further dermatitis has developed.

The above are only a few of those treated by this method, but they serve as illustrative examples of the value of this simple device.

This "Filter" consists simply of a disk of sole leather five inches in diameter; or if the hard rays are to be removed a

disk of pure silver may be used. This is placed over the diaphragm opening. The size of the opening will of course vary with the part treated. The tube is set in position about an inch or less from the diaphragm. In order to resemble the skin more closely I soak the leather in water.

When this wet leather is placed over the hand and a radiograph made it seems to obliterate the shadow cast by the skin. However, I consider the clinical evidence far more convincing than the radiographic evidence. I have not made clinical application of the hard-ray filter, because I do not see such a great need, nor do I see clearly any method of drawing accurate conclusions even when it has been used. It may be useful in limiting the application of the rays to the skin in cases in which deep penetration might do harm, such as the treatment of the scrotum, where damage might be done to the testicle.

It is possible, too, that we may improve some of our radiographs by filtering out some of the soft rays, or some of the hard rays depending upon which are likely to be in excess of the needs of a good radiograph.

As a whole, this ray filter seems to be a decided step in advance. While this must be taken as a preliminary report, and not make any one bold, my results have been convincing to me and I can most earnestly recommend its use.

MODERN SKIAGRAPHIC TECHNIQUE

BY OTTO JUETTNER, M.D., PH.D., OF CINCINNATI, OHIO

Director of the Roentgen Laboratory of the "Cincinnati Post-Graduate School of Physiological Therapeutics," Fellow of the "American Electro-Therapeutic Association."

THERE seems to be no doubt that the method of taking X-ray pictures is to a large extent the result of habit and convenience and is, therefore, with most operators an entirely personal problem. It is true that there are certain vague notions of fundamental principles which serve as a groundwork for skiagraphic procedures generally. In point of detail, however, and with reference to the conscious adaptation of radiographic work to specific anatomical problems, making the former subservient to the latter, the subject lacks much from being a uniform and logically developed *system* of scientific research. It represents a loosely connected series of *methods* and amounts to just as much as the diagnostic judgment, skiagraphic skill and reasoning power of the individual operator will allow. It seems to me that the topographic landmarks of this most fascinating and ever-important subject are clearly enough marked to admit of the recognition of more than the hitherto accepted vague and ill-defined outlines.

What is meant by a *good* X-ray picture? A striking *photographic* result appeals to the average physician because it possesses the elements of beauty which we are in the habit of admiring in pictures generally. The thoughtful radiographer, especially if he happens to be a good surgical anatomist, not infrequently remains indifferent at the sight of what others rave over, and often becomes interested when others see nothing of any consequence in a skiagraph. Why should this be so? The reason becomes apparent when we consider that

the discriminating power of the eye of the layman is exercised in the differentiation of lights and shadows and the relation of these to each other. The eye is not accustomed to any other kind of reasoning. It can appreciate the lights and shadows of the real object and can, therefore, see the features and details of a picture or a photograph of the real object. A skiagraph is not the photographic reproduction of a real object. The innumerable waves of energy that emanate from the surface of the X-ray tube and, after traversing space and penetrating the object, strike every point of the exposed sensitive plate, leave a sum-total of impressions behind which are a truthful record of the density of the object at every point. A photograph is a record of impressions made by rays of light of various degrees of intensity from the object. There is no suggestion of density or interception, partial or complete, of light rays.

This, however, is exactly what the X-ray picture presents. There are no light-rays coming from the object. The rays go *through* the object, each wave encountering a certain resistance determined by the density of the tissues traversed by that particular wave. The greater the degree of density, the more marked will be the interception of the quantity of force represented by that wave. When it finally reaches the sensitive plate, it leaves at one point a record of relative density of the tissues traversed. The sum-total of these density records is a skiagraph. The latter is not the picture of a real object, but the pictorial record of a physical characteristic of the object. The skiagraph, therefore, is not a representation *of* an object, but rather an abstraction *from* an object. To give this abstraction a physical reality requires the application of a radiographically trained eye and mind. The failure to grasp the fundamental difference between a *photo*-graph (*light*-picture) and a *skia*-graph (*shadow*-picture) explains many errors of judgment on the part of not a few X-ray operators.

The skiagraph or X-ray picture is in reality "a density-record deposited on a sensitive plate." This definition is a splendid starting point for the discussion of the principles which should be known and followed in the work of taking such records, i. e., in doing skiagraphic work. The evolution of these principles from the definition given is a simple process of reasoning. If the X-ray picture is a density-record, it presupposes on the part of the operator the knowledge of the two elements which determine the production of such a record, to-wit:

1. The approximate degree of density of the object;
2. The penetrating power of the force which is variously intercepted by the more or less dense tissues of the body.

I propose to discuss the subject of radiographic technique from these two points of view; if our premises are correct, the conclusions must necessarily be above criticism.

The Density of the Object

The density of an object is the latter's power of resisting ray-penetration. A thin part, like the hand, offers but little resistance to the waves of X-ray energy coming from the tube. For this reason, penetration is easily effected. Everybody is familiar with the skiagraphic or fluoroscopic picture of a hand. The greater density of the bony tissue makes the shadows of the phalanges darker than the shadows of the soft parts which are less dense and, therefore, cast a lighter shadow. The point to be remembered is that it is not a question of thickness, but of density. It makes no difference whether we lessen the transverse diameter of a part by pressure and thus make the part thinner. Compression of a part diminishes the thickness, but does not change the density. The tissues are

matted together, occupy less space, but are not rendered less dense. This fact furnishes the best evidence against the so-called compression-diaphragm which is just now attracting some attention among X-ray operators. It is supposed that we can lessen the distance between the X-ray tube and the sensitive plate by firm compression of the intervening object and in this way facilitate penetration of the object. Since lessening of bulk does not mean reduction of density, the error in the argument is apparent.

Compression is not only unnecessary, but in many instances decidedly undesirable. Aside from the discomfort which a patient is bound to suffer, a certain change of relative location or a malposition of the parts is liable to occur and thus a diagnostically worthless picture is apt to result. This is especially the case when we are dealing with a freely movable foreign body. Aside from the damage which is liable to be inflicted upon the surrounding tissues by the sharp and pointed contour of a foreign body, compression of the part containing the foreign body is certain to change the relative position of the latter, the change of position being determined by the tendency of the foreign body to move in the direction of least resistance, i.e., away from hard or resisting tissue and in the direction of soft, non-resisting tissue.

I have demonstrated this point to my satisfaction before the class of the "Cincinnati Post-graduate School of Physiological Therapeutics" by skiagraphing a bullet which was imbedded in the fleshy part of the thigh. By using a so-called compression-diaphragm I was able to obtain six different X-ray pictures of the subject, no two pictures showing the foreign body in the same relative position. I could have added pictures of the same subject *ad libitum*, the degree and direction of the pressure determining the skiagraphic result. There is not the least doubt that compression is theoretically wrong and practically misleading to the surgeon and uncomfortable to the patient.

The idea of compression was probably suggested by a misconception of the principle of immobilization which in skiagraphy as well as in photography is a factor of prime importance. Since snap-shots are unknown in X-ray work, the objects we attempt to skiagraph must remain unmoved during the time of exposure. To aid in preventing change of position, we can immobilize almost every object in a simple, effective and painless manner. This is accomplished by mere contact with or very gentle pressure of the lower end of the cylinder which is interposed between tube and object for the purpose of eliminating various disturbing forms of ray-energy emanating from the X-ray tube and interfering with the X-rays proper. This will be better understood by a closer study of the

Penetrating Power of the Energy Emanating from an Excited X-ray Tube

That the X-rays do not represent the only force-modality given off by the X-ray tube, is generally admitted. The sum-total of energy generated is composed of high-tension electricity (sparks, brush-discharges, and a surplus of static electrical force which accumulates within the magnetic field of the tube), heat-rays, ozone, dynamic waves, induction-products and many other forms of force-manifestation mentioned by numerous authors (Freund, Schiff, Bang, Tesla, Kaposi, etc.). The X-rays proper are induced on the outer surface of the tube, radiating in front of the anodal plane at right angles to the tangent of the point of issue. The vital question of overtowering importance is: What is the active principle in these mysterious, invisible force-manifestations? What gives the later their therapeutic and skiagraphic action? The trend of thought along this line is reverting to the views advanced some years ago by many observers (Elliot, Stenbeck, etc.), who clas-

sified the Roentgen rays under the head of ultra-violet radiations. Theoretical considerations as well as practical experience seem to support this view in no uncertain manner.

The radiations coming from the extreme red end of the spectrum are characterized by short waves and comparatively slow vibrations. As we approach the violet end, the waves increase in length and rapidity of vibration. We also know that the angle of refraction becomes more acute as we leave the red and approach the violet field. Adding to this fact the positively known passage of true chemical rays from the inside of the tube through the glass, we have no hesitancy to identify those rays which have been described as Walter's secondary or tangential radiations. They are without a doubt these intratubular chemical (ultra-violet) rays refracted by the glass wall of the tube which acts like a prism. After being thus refracted they pursue a straight path, intersecting the diverging X-rays and penetrating any obstacle as far as their carrying power will permit and possibly being again deflected from their path if they should meet with any obstacle capable of refracting and deflecting them.

In this way they may reach a sensitive plate, leaving a faint density-record upon it which, of course, will not coincide with the X-ray shadow, but as a secondary shadow, not sufficiently well marked to possess any individuality but just enough to have a blurring effect. This blurring effect causes the X-ray outlines of a picture to appear less sharp and well-defined. As a result, we get flat X-ray shadows, without character, detail or perspective, whenever we attempt to make a direct exposure of an object to the X-ray tube. A device for the interception of the tangential rays has become a necessity without which skiagraphic work nowadays is practically impossible. In the light of modern radiologic observations it would not be preposterous to assume an active phosphorescent state of the tissues, produced by the diffused tangential radiations. This mild degree of phosphorescence is sufficient to explain the general faint fogging of the plate and the flattening of the picture.

That the Roentgen rays proper have many generic traits of resemblance to the long-wave and rapidly vibrating ultra-violet radiations, cannot be denied. The molecular skin-gangrene which follows prolonged exposures to the solar actinic rays (Finsen) seems to be analogous to the molecular death produced by the Roentgen rays. The difference seems to be one of degree of penetration only. The effect on a sensitive plate is certainly similar, the difference seemingly being only one of penetration. That the actinic rays of the sun or the electric arc-light are capable of penetrating the yellow and black envelopes containing a sensitive plate, can easily be demonstrated by experiment. Even a comparatively short exposure will result in fogging the plate. The increase in the quantity of chemical rays in the soft tube together with the diminution of their carrying or penetrating power, is another significant point. This point suggests the law which underlies the adaptation of the excited X-ray tube to any skiagraphic or therapeutic purpose, to-wit:

"Hard tube, scant output, great penetration; soft tube, copious output, slight penetration."

The conclusions to be drawn from this well-established law are:

1. Use a relatively hard tube whenever a high degree of density is to be overcome. The harder the tube, the greater its penetrating power. The harder the tube, the longer the exposure of a deep part on account of the scant output of energy. The harder the tube, the slighter its therapeutic usefulness. The hard tube is the skiagraphic tube *par excellence.*

2. Use a relatively soft tube in skiagraphing thin parts which do not require much penetration. The softer the tube, the more intense its effect on superficial parts on account of the copious output of energy and comparatively slight penetrating power. The softer the tube the greater its therapeutic usefulness. The soft tube is the therapeutic tube *par excellence*. The proper therapeutic field of the X-rays is the skin and the subcutaneous tissues.

These statements are supported by overwhelming clinical evidence furnished by thoughtful observers the world over.

Enough has been said to show the importance of the *vacuum* of the X-ray tube in adapting a given tube to a given skiagraphic or therapeutic purpose. The vacuum determines the character of the radiations produced. From the lowest vacuum to the highest we have numberless degrees of energy and penetrating power.

The problem of greatest import in the accomplishment of a skiagraphic purpose is the elimination or interception of all waves of radiating energy which pursue a path different from that of the X-rays proper. The more successful we are in this purpose, the clearer and better defined will be the outlines of the shadows even of faint and insignificant details. We must prevent the phosphorescence of the tissues produced by the indiscriminate diffusion of secondary radiations. To accomplish this purpose the German investigators, notably Albers-Schoenberg, use an adjustable lead-lined cylinder which is interposed between the tube and the object and allows a cone of X-ray energy to pass through it down to the object and sensitive plate. The tangential rays are held up by the cylinder and are thus prevented from scattering through the object. The Germans call this device a *Blende* (a "blind"—device to keep side-lights out of horses' eyes). "Compression-diaphragm" is a bunglesome translation because the device is neither a diaphragm nor does it compress. Since the "Blende" is analogous to the camera in photography which gathers in the desirable rays and shuts out side-rays, it seems to me that the term *X-ray Camera* is the best and most befitting appellation.

Skiagraphy without some sort of X-ray camera is today an unscientific proposition. Without going into tiresome detail let me formulate the technical part of making an exposure into the following general rules:

The region to be skiagraphed should be placed so that the most important part of it (fracture, foreign body, etc.) shall rest directly over the center of the sensitive plate. The object shall be as close to the plate as possible. The part containing the "object" must be placed with this purpose in view, the anterior or posterior surface next to the plate, whatever surface is closest to the object. (A bullet near the spine would require the patient in the dorsal decubitus, a bullet in the anterior abdominal wall would necessitate the patient being placed on his stomach.) The cylinder of the camera is pointed toward the object, the lower end of the cylinder and the upper surface of the region to be skiagraphed being in contact. The longitudinal axis of the cylinder should pass through the object down to the center of the sensitive plate. Directly over the upper opening of the cylinder the tube is mounted, the anodal focus being in the median line. The position of the anodal disc with reference to the cylinder is theoretically immaterial, practically dependent on certain conditions of convenience. If it is parallel to the sensitive plate which is lying horizontally on a solid base, such as a table, the adjustment of the whole arrangement from plate up to the tube is simple. The longitudinal axis of the cylinder strikes the anodal focus above and the center

of the sensitive plate below. It is needless to say that it strikes the anodal plane and the sensitive plate at right angles, the two being parallel. Thus we get a cone of light, whose apex is the anodal focus, whose base is the circle of light corresponding to the shape of the lower end of the camera-cylinder from which the symmetrically diverging rays emerge. The principal part of the arrangement is that the anodal focus is strictly in line with the longitudinal axis of the cylinder. Hence it makes no difference whether we place the anode parallel to the sensitive plate or not. If the anodal focus is not strictly in the median line, an asymmetrical cone of

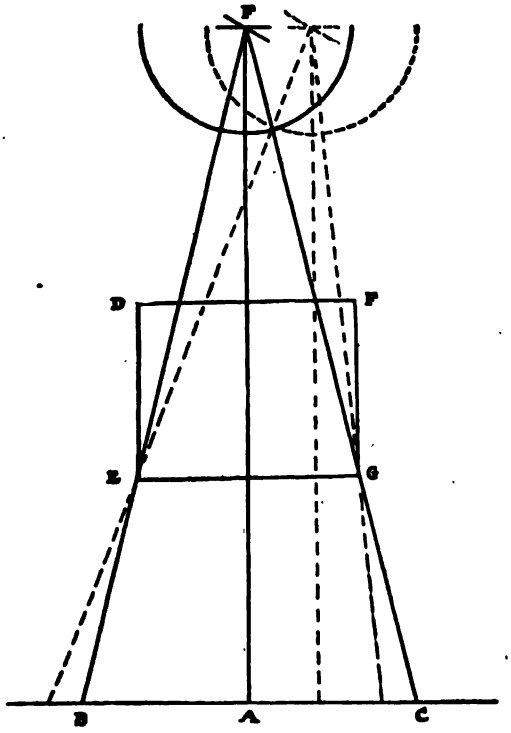

Figure I.

light will be the result, with corresponding distortion of the shadows on the plate. Compare the accompanying diagram (Fig. I) with what has been said, and there will be no difficulty about understanding the principles involved.

The anodal disc is parallel to the photographic plate. This is not essential as long as the central point of radiation (anodal focus) remains in the median line. Even if the anode were not parallel to the plate, the anodal focus being in the median line (longitudinal axis), the cone of light would remain the same. An entirely different effect would result if the anodal focus were not in the median line. The cone of light would be distorted, the rays striking the plate at different angles. In the accompanying diagram *F* represents the anodal focus, the anodal disc being shown in two positions, parallel and oblique. *F B C* is the cone of light, whose diameter is determined by the size of the lower opening of the cylinder *D F E G*, through which the rays pass. *F A* is the longitudinal axis, which coincides with the median line of the cone. The diffusion of light is symmetrical. The dotted lines represent the effect which is produced by the anodal focus being away from the median line of the cylinder. As a result the cone is distorted, which in skiagraphy is equivalent to an asymmetrical diffusion of the shadows.

Geometrically the laws of X-ray diffusion may be summarized as follows:

The ray which strikes a photographic plate at right angles is the shortest line between plate and anodal focus. It is known as the *anodal axis*. We refer to it as the *absolute* or *relative* anodal axis, according as the anodal disc is parallel to the photographic plate or not. The anodal axis should pass through the center or near the center of the region to be skiagraphed. Being the shortest line, it is the strongest ray. The longer the ray, the more energy is lost. The position of object and tube is correct in proportion to its relative approach to the ideal arrangement, which consists in the absolute anodal axis passing through the center of cylinder and region to be skiagraphed. This ideal position should be the criterion under any and all cir-

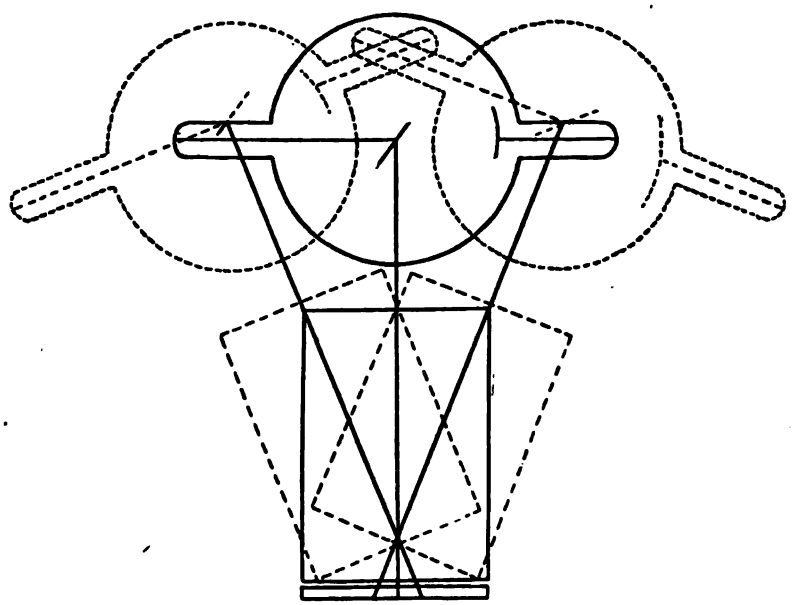

Figure II.

cumstances. Anatomical peculiarities sometimes make it impossible to realize this perfect arrangement. We sometimes must incline the cylinder, *i. e.*, put it in an oblique position in order to aim at a special part properly (*e. g.*, skiagraphy of the dorsal vertebræ, with the patient on the back, the cylinder of the camera being placed over the epigastrium and directed downward and upward. In this position we avoid the shadow of the sternum). The horizontal plane of the region to be skiagraphed should be parallel to the photographic plate and as close as possible to it. With these points firmly fixed in our minds, we should not experience much difficulty in arriving at a relatively correct arrangement of plate, object, cylinder and tube.

Having selected a tube of proper vacuum for a given skiagraphic problem, the duration of the exposure is the next question. Always give the tube as much current as it will stand, which practically means as much as your coil will generate. Learn to make use of spark-gaps to support a tube which is not holding out well. A low estimate of the time of exposure would be five seconds for a hand, twenty seconds for a wrist, one-half minute for an elbow or ankle, one and one-half minutes for a knee or shoulder, two and one-half minutes for a hip, three minutes for a spine. The employment of a good coil and a reliable tube is presupposed. If the developed plate shows faint, grayish shadows throughout, the exposure has been too short. Bold black shadows where the rays have struck the plate directly and fine detail and contrast in the dense parts are the characteristics of a good skiagraph.

The discussion of skiagraphic technique would hardly be complete without at least passing notice of the greatest and most gratifying achievement along the lines of radiography, to wit: *stereo-skiagraphy*. It is analogous to stereophotography, or the art of photographing an object from two different points of view, equidistant from the median line. By a suitable stereoscopic device

we can see the two pictures at the same time, giving us the impression of plasticity of a real object. The technique is simple. Place the object on the plate and skiagraph it from one side, then from the other, care being taken to point the cylinder at the object exactly at the same angle. (Fig. II.) By placing the cylinder directly over the object, as we would ordinarily do, we get the perpendicular median line. (See diagram.) Move the cylinder 1½ to 2½ inches away from the median line and incline it at an angle which will admit of full exposure. Then skiagraph in a similar manner from the other side. Place the two negatives or finished pictures in a stereoscope and the effect will at once become apparent. Where it is a question of determining the contour of a foreign body and its position with reference to its surroundings, the stereo-skiagraphic method is of inestimable value. It is a special line of X-ray photography which is entitled to more attention and study than it has hitherto received.

EDITORIAL

THE AMERICAN ELECTRO-THERAPEUTIC AND ROENTGEN RAY SOCIETIES.

MANY facts of interest and importance bearing upon the present and future of electro- and radiodiagnosis and therapy were brought out during the annual conventions of these bodies, which took place in September, but probably the most gratifying, certainly from the standpoint of the electro- and radiotherapeutists, is that the profession at large is taking a much greater interest in such problems than formerly, as indicated by the increase in the membership of these organizations and the large attendance at the sessions of the conventions. This was particularly noticeable, proportionately, in the case of the first-named, the number of its active members having nearly trebled during the past three years. The annual statements also showed that both institutions were in an eminently satisfactory condition financially, and most favorably situated, as far as material prosperity is concerned, for carrying on the work for which they were organized.

There is prevalent in many quarters, a feeling, which has been growing stronger during the past three years, that these two organizations could do more work, better work, and effect greater results if they were amalgamated, or if they should hold their conventions at the same time and place, and we believe that these plans are worthy of serious consideration. Combination has been proven to be the keynote to development and the achievement of great results in the field of industrial production today, and the same econ-

omic principles involved in that sphere of activity apply, to a very large extent, to the management of societies owning utilitarian aims, especially where these aims are as closely allied, generically and practically, as are those of these two organizations. Logically, from an evolutionary and utilitarian standpoint, they should never have existed separately; actually, their ultimate amalgamation would seem to be inevitable, and if such is the case the sooner the union is effected the better.

Among the more prominent reasons why amalgamation would seem to be desirable may be mentioned the following:

First, the forces for the study of which these societies were organized, are intimately related and the pathological phenomena in connection with which they are utilized are, in some cases, identical.

Second, a considerable number of the members belong to both bodies and would like to attend the sessions of both, but this entails a double loss of time and a double expenditure of money for railroad fares, hotel bills, and dues, all of which disadvantages would be eliminated if amalgamation were adopted.

Third, many of those who now use only the Roentgen ray, employ for its generation apparatus which is capable of producing other therapeutical forces. Amalgamation would result in acquainting these men with the practical application of the potentialities of their apparatus; in disseminating a knowledge of general electrotherapy. There is, in the electro-therapeutical body, a strong Roentgen ray element, and in the Roentgen ray organization a strong electro-therapeutical element; union would broaden the scope of both societies, augment their scientific and humanitarian effectiveness, and permit of a more fruitful study of these forces because they would then be compared and developed under conditions most favorable for ascertaining their absolute potentialities and limitations.

Fourth, manufacturers' exhibits of apparatus constitute a feature of the conventions of both societies. Some manufacturers will exhibit before one body but will not feel justified in incurring the expense of exhibiting before both. If the societies were united a larger and better exhibit would be assured, to say nothing of the saving of expense to the exhibitors.

Fifth, the money which would be saved by having only one set of convention expenses, one set of transactions, etc., would be a large and most helpful addition to the funds available for developing the objects of these organizations. The American Electro-Therapeutic Association disbursed $150.00 most profitably for special committee work alone last year, and it is only by thus providing for the expenses of committees specially appointed for the carrying out of specially-designated investigations, that the most can be gotten out of the experimental findings so necessary for the logical development of any science or art.

Sixth and lastly, the development of the various other elements of physiological therapy has reached a point where the need of an American society for the study of these remedial measures is being urgently felt. The American Medical Association has failed to satisfy this want, although hundreds of its members have earnestly requested the formation of a section on this line of therapeutics, and the only resource is the formation of a separate society. Amalgamation of the American Electro-Therapeutic Association and the American Roentgen Ray Society would constitute a powerful and advantageous nucleus, from which might easily be elaborated a national society for the study of physiological therapy, whereby an onerous multiplication of separate societies would be avoided.

The most serious objections that have been urged against amalgamation are that the manufacturers who are now members of the Roentgen Ray Society could not be accepted by the Electro-Therapeutic Association, and that it would be impossible to confine the present combined programmes to a three days session.

The first objection has no foundation in fact, as the constitution of the American Electro-Therapeutic Association provides for the admission of "electrical experts" as associate members, and manufacturers come under that designation.

The second, if it were found to exist, could be disposed of by dividing the programme into two sections, one on electricity and the other on radiant energy, which could be in session simultaneously at different meeting places.

We feel that the above-stated arguments are sufficient to justify the appointment of committees from the two societies for the purpose of consulting as to the advisability of combining their forces, and earnestly hope that the trend of the times will be duly appreciated by those from whom such action should emanate.

The newly-elected officers of the American Electro-Therapeutic Association are Dr. W. B. Snow of New York City, president; Drs. W. J. Herdman of Ann Arbor, Mich., and Henry Finkelpearl of Pittsburg, Pa., vice-presidents; Dr. A. C. Geyser of New York City, secretary; Dr. R. J. Nunn of Savannah, Ga., treasurer; and Drs. Emil Heuel and Morris Brinkmann of New York City, executive council.

Of the American Roentgen Ray Society, Dr. Henry Hulst of Grand Rapids, Mich., president; Drs. Russell H. Boggs, of Pittsburg, Pa., C. E. Skinner of New Haven, Conn., Ennion G. Williams of Richmond, Va., and F. W. Caldwell of New York City, vice-presidents; Dr. George C. Johnston of Pittsburg, Pa., secretary; Dr. L. E. Custer of Dayton, Ohio, treasurer; and Drs. Joseph F. Smith of Chicago, Ill., Preston M. Hickey of Detroit, Mich., and Kennon Dunham of Cincinnati, Ohio, executive committee.

Full abstracts of the proceedings of both bodies will be published in coming issues of THE ARCHIVES.

JOURNAL OF ADVANCED THERAPEUTICS

New York, N. Y., September, 1905

1. The Association of Physical Methods and Therapeutics — Wm. Benham Snow.
2. Some Observations Upon the Treatment of Lupus Vulgaris by Phototherapy, Radiotherapy, and Otherwise — Chas. Rea Dickson.
3. Locomotor Ataxia Successfully Treated with Ultra-Violet Rays — J. Monroe Liebermann.
4. Report of the Committee on Current Classification and Nomenclature.
5. Summary of an Experimental Inquiry on the "Diaphragm Symptom" in Chronic Pulmonary Tuberculosis — C. M. Desvernine.
6. Artificial Nauheim Baths, in the Treatment of Chronic Heart Disease — Samuel G. Tracy.

1. Snow deplores anyone's confining themselves to any one sort of therapy, and says that the only way to practice medicine today is to understand all sorts of therapy and apply that combination of the different modalities which is indicated by the pathology of the case under treatment. After discussing this proposition at considerable length he applies the postulate very briefly to several different diseases.

2. Dickson uses the condenser spark lamp with iron electrodes known as the "Ultra" in his therapeutic work, exciting it with the electric current drawn from an ordinary incandescent lamp socket. The light from this apparatus is very rich in violet and ultra-violet rays, more so than the Finsen light, hence is more powerfully and more rapidly bactericidal and the time of exposure is materially lessened; from three to ten minutes only being required instead of from half an hour to an hour with the Finsen lamp.

He considers that 10 grains of bisulphate of quinine an hour before each treatment produces artificial fluorescence of the tissues and that this procedure is of very great advantage.

If crusts or scales are present they should be removed before treatment by the application of glycerine which contains 25% of oil of eucalyptus, if possible. If they cannot be removed then the ray may be proceeded with allowing the glycerin to remain on until the close of the treatment. If they cannot then be removed they should be kept covered with white vaselin until the succeeding treatment when they can almost always be removed. Water or aqueous solutions should not be used on the unbroken skin, but this should be cleaned by wiping with vaselin and kept as dry as possible. In cases where the edges of an ulcer are healing slowly and the disease is not deeply seated the application of a very thin layer of vaselin to the edges before raying has seemed to accelerate healthy granulations. Dickson considers that white vaselin fluoresces a brilliant violet under the ultra-violet rays, while ordinary vaselin fluoresces a greenish blue and to a much less degree, and, moreover, being of a yellow color absorbs the greater portion of the rays. Rays of short wave length are absorbed and neutralized by those of greater length, and the greater the disparity the greater the amount of absorption, hence the short ultra-violet rays are thus affected to the greatest degree by those at the opposite end of the spectrum, the long red orange and yellow. For this reason the removal of crusts before phototherapy is employed is especially necessary, the color of the crusts, reddish or yellow, not permitting the full action of the ultra-violet rays upon the parts beneath.

He usually covers the surrounding healthy tissues by sheet lead or tin foil, leaving about a quarter of an inch of sound tissue margin about the diseased

area. The eyes of both operator and patient should be protected also when exposed either to the ultra-violet rays or X-Rays and he has found oiled muslin or large goggles effective for such protection. When the skin is broken or ulcerated the part should be cleaned off with vaselin after each treatment, and a very thin layer of some emolient ointment (compound thuya ointment being preferred) spread on sterilized linen and applied to the ulcer carefully, avoiding surrounding sound tissues which should be kept dry. This dressing should be changed two or three times daily according to the amount of discharge. If the discharge is very profuse a dusting powder should be used instead of the ointment until the discharge has lessened materially. Resinol ointment and lanolin are useful for combating erythema in surrounding tissues.

As between phototherapy and X-Ray therapy the former is to be preferred for lupus vulgaris but combination of the two methods is frequently to be commended. In the case of small lesions phototherapy possesses the advantage because, by its use, small circumscribed patches may sometimes be caused to disappear after two or three vigorous exposures. Better cosmetic results can be obtained by phototherapy, the extent and degree of action being more under control and reaction is less prolonged. It is also the preferable method for indurated marginal areas such as the lobe of the ear or other parts liable to break down under vigorous X-Raying; also where tissues are thin as the cheek, and where deep penetration is not required.

X-Ray applications are preferable when the area involved is extensive, as a larger area can be treated at once; also where greater penetration is required as when the tissues are tumified or hypertrophied or pigmented. In the last-mentioned case the greater proportion of the ultra-violet rays will be absorbed and neutralized before reaching the seat of the disease. Radiotherapy is also more applicable where mucous membranes, not easy of access to ultra-violet rays, are involved, as the nasal for instance. In some cases the X-ray seems to lose its effectiveness after a while or the parts appear to become abnormally sensitive to it. Under such conditions recourse may be had to the ultra-violet ray for a time until the parts recover their tone and then a return made to the X-Ray.

Several cases are cited illustrating the good effect of combining phototherapy, X-Ray therapy, brush discharge, etc.

3. See THE ARCHIVES for October, 1905.

4. See THE ARCHIVES for June, 1905.

5. This is the unexpected conclusion of an article the first portion of which appeared in "Advanced Therapeutics" for July, 1905, and was abstracted on page 136 of the September ARCHIVES. The final conclusions to which Desvernine's experiments gave rise he sums up as follows:

"I. Greater importance should be attributed from the diagnostic and pathological point of view to the element of nervous intoxication in the course of chronic pulmonary tuberculosis.

"II. One of the bacillary products—tuberculine—deranges the normal function of the pneumogastric nerves through intrapulmonary intoxication.

"III. The tuberculine intoxication of the said nerves gives rise to vaso-paralytic phenomena of the inferior portions of the lungs, and directly, also, to diaphragmatic paralysis.

"IV. The diaphragmatic inactivity is independent of the vascular changes taking place in the lungs.

"V. The pulmonary vasa-paralytic congestion is homo-lateral, or hetero-lateral with regard to the seat of the intrapulmonary intoxication, and even bi-lateral; while the diaphragmatic paralysis has been, so far, always homo-lateral.

"VI. The bacillary infection of the inferior lung segments is favored, in apex tuberculosis, by the vascular and diaphragmatic derangements brought on by the intoxication, and once started, is liable to assume a great malignancy therefrom."

6. The natural spring waters at Nauheim contain from two to three per cent of sodium chloride and from .002 to .003 per cent of calcium chloride besides small quantities of various salts of iron, but Tracy considers the most important ingredient to be the large amount of carbonic acid contained in them.

Many attempts have been made to reproduce artificially the saline carbonated baths but only one has been at all successful. This method consists of the use of liquefied carbonic acid gas and a specially devised apparatus in which the liquid carbonic acid gas passes into a cylinder containing a brine solution. There, by means of paddles, rotated by an electric motor, the gas, salts, and water are intimately mixed. Each bath requires about one and one-half pounds of liquid carbonic acid gas, and it is so thoroughly mixed with solution that the gas remains uniformly in it, for two hours after carbonating. It has been found by a chemical examination to contain almost the entire amount of carbonic acid gas for 24 hours; it does not corrode the skin, and can be made ready for use in five minutes. The amount of salts or carbonic acid can be increased or decreased at will so as to correspond with the natural spring numbers of seven or twelve of Nauheim, Germany.

There are various theories as to how the beneficial influence of the Nauheim bath is produced and the subject is still *sub judice*. The physiological effects are as follows:

"On entering the bath for the first time, the patient experiences a slight depressive feeling in the chest, but this is usually succeeded in a few minutes by a general sense of warmth and well being. The pulse is now taken, again at the first half of the bath, and at the end of the bath. The effect of the bath is to slow the number of pulse beats, and to increase the blood pressure. If irregularity has existed, it gradually becomes less marked. The area of cardiac dullness is diminished and the heart sounds become clearer and stronger. The beneficial effects on the circulation do not disappear at once, but persist for several hours, and, by repeated baths, the burden is removed from the over-loaded heart, and the latter is given a chance to make its own repairs."

Plain brine bath alone increases the blood pressure from five to ten mm., and the saline carbonated bath increases it from ten to thirty mm. If the blood pressure is diminished after the bath it indicates that advanced myocardial degeneration or pronounced arteriosclerosis are present. If the blood pressure is as low as 65 ma. it means that the Nauheim baths are contra-indicated.

The Nauheim baths are indicated in all cases of dilated, enfeebled, or irritable heart action.

They are also indicated in the conditions of general debility. The method of giving the bath is as follows:

"First the patient is divested of his clothing, then the pulse is taken, after which he is put in the bath at a temperature ranging from 96° to 86° F., depending upon the case. As soon as the patient is submerged in the effervescent saline water, millions of gas bubbles attack the nerve filaments in the skin, and the patient feels as though a very mild electric current was passing through him. This bath lasts from eight to twenty minutes, during which time his pulse is taken twice, and each time the number of beats are less per minute and the quality of the pulse stronger. Now the patient is enveloped in a large Turkish towel and dried, and he returns to his couch, where he rests from one-half to three-quarters of an hour or longer. This is followed

in heart cases by the Schott resistance movements, a sort of physical exercise. These movements, which are given from five to fifteen minutes, have nothing to do with gymnastics in the ordinary sense of the word. They, doubtless, in the end, increase the muscles generally, but this is not their primary object. It should be distinctly understood that each exercise is designed to produce regular movement with but little exertion, and absolutely no fatigue. There are sixteen of these exercises arranged either for upper or lower extremities, or the trunk, and while they are made, the operator offers a slight resistance to each one.

"During the exercises, the patient should breathe regularly, and no limb, or portion of the body should be so constricted as to compress the blood vessels, and thus check the circulation."

Tracy also quotes Dr. James Anders, abstract of whose article on this subject will be found on page 210 of THE ARCHIVES for October, 1905.

ARCHIVES OF THE ROENTGEN RAY

London, England, September, 1905.

1. X-ray in Acne, Eczema, and Malignant Disease — W. Kenneth Wills.
2. The Employment of X-ray in the Diagnosis of Injuries and Disease of Bones and Joints — Samuel Beresford Childs.
3. On Osseous Formation in Muscles due to to Injury (Traumatic Myositis Ossificans) (*Cont.*) — Robert Jones and David Morgan.
4. Case of Extensive Tubercular Disease of the Glands of the Neck Treated with X-rays — G. Constable Hayes.
5. Combined Surgical Procedure and X-rays in the Treatment of Rodent Ulcer — J. Hall-Edwards.
6. The Relief of Rheumatism Pains by Thorium Salts — Horace Manders.
7. The Development and Present State of Radiology — Dr. Albers-Schoenberg.
8. The Electrical Department, St. Bartholomew's Hospital — H. Lewis Jones.
9. On the Advisability of Giving Farinaceous Foods in a Form Compelling Mastication — Harry Campbell.

1. Wills considers the X-ray treatment of acne as rapid in action and brilliant in results. The results are permanent, but a possibility of over-treatment exists. The expense of treatment seems high, but is really not so since the amount paid for a cure is usually less than that paid for advice, extending over years of useless treatment. He prefers to obtain a distinct erythema followed by some exfoliation of the skin, which erythema he maintains for a time during which the nodules disappear, ulcerations heal and the skin becomes dry and supple. A tendency toward flushing remains after the suspension of treatment but gradually disappears.

He tests the susceptibility of the patient to the ray, uses carefully adapted screens and a short, gradually-increased dosage; usually not more than a dozen treatments are required to produce uniform and permanent success.

In chronic eczema the rays act as an efficient stimulant, and the effect is noticed after a few treatments. Relief from the itching is marked.

In fifteen cases of carcinoma relief from pain was the only effect noticed, though in several cases recurrent nodules disappeared, glands softened and decreased in size, but the patient succumbed to internal metastasis. Most of the cases were far advanced and in two, following the production of slight burns, the disease extended rapidly.

2. The surgeons concede that there are some forms of injury to bones especially about the joints, where a diagnosis by ordinary methods is impossible and an apparent reduction of the fracture or dislocation may be followed by a bad result. Before the days of the X-ray such errors were unavoidable, but today

when nearly every city has a reliable X-ray operator, such bad results due to malposition of the fragments or failure to reduce dislocation should become rare. Before a positive diagnosis is made in such cases, a skiagram should be made both antero-posterior and lateral. After reduction, examination will show the position of the bones and the efficiency of the retentive apparatus. It is the duty of the surgeon to himself and his patient, to decline to commit himself where he cannot absolutely satisfy himself as to the exact nature of the injury, until he has the evidence of the properly-made and interpreted skiagram. This is a permanent record of the conditions present and if these are such that disability is bound to follow, the surgeon cannot be held responsible for such results, if he has warned his patient. When such becomes the universal practice a strong barrier will be placed against malpractice suits.

Unfortunately the skiagram does not show the injury to the soft parts in fractures or dislocation. Any skiagram introduced as evidence must be taken by an expert only and only an expert's interpretation of it received, since distortion is easy and a slight deformity may be greatly magnified thereby. It is possible for a fracture to unite so perfectly that no line of union can be detected after a few months. This is, however, exceptional.

4. Hayes's case, aged 4, was admitted in February, 1905. Following an attack of scarlet fever in 1904 glandular abscesses of the neck appeared. On admission the entire neck on both sides was inflamed, with numerous sinuses, large masses of glands under the sternomastoid and in the submaxillary and submental regions.

A current of three to five milliamperes, with a tube distance of nine inches, and five minute exposures daily, comprised the technic employed. Within two weeks the discharge lessened and the glands were smaller; at the end of six weeks all sinuses had ceased discharging. The skin was healthier and the glands were greatly reduced. Treatment continued until May 6, and the child was discharged, cured.

5. The tendency of rodent ulcer to recur following a clinical cure by X-ray, is discussed by Hall-Edwards, and in many cases there seems to be no reason why this should be so. He has found that the results are much more satisfactory and permanent if the ulcer is scraped prior to the application of the X-ray.

He reports a case in illustration. Woman aged 27, with both eyelids covered with warty growths, and the eye useless from an opacity of the cornea. When nine years of age, a small wart appeared on the lower eyelid, which grew and was pinched off; later several others appeared and finally the whole of the lower eyelid became involved. The growths were removed three times at an Eye Hospital and returned, increased in size and number. The redundant growth was snipped off and some pieces examined by the pathologist, who reported typical rodent ulcer. Thirteen daily exposures of ten minutes, at a distance of six inches, were given beginning four days after operation, and two weeks later the lids were completely healed. Later the eye was enucleated, and five months later a small patch of ulcer on the side of the nose, which still remained, was touched with strong hydrochloric acid, and a series of ten X-ray treatments were administered, resulting in a complete cure. He is convinced that surgery and X-ray combined can cure many cases which could not be successfully treated by either alone.

He advises that small ulcers be either scraped or destroyed by strong hydrochloric acid before X-ray treatment and that during treatment the lesions be kept as aseptic as possible.

6. The relief of the pain is of more

importance than agreement as to the cause of the toxaemia known as rheumatism. The success of high frequency currents in relief of muscular rheumatism is encouraging, but in chronic sciatica and articular rheumatism from two to three hundred applications may be necessary to obtain success. The author's idea is to keep alive the effects of the high frequency currents during the intervals between treatment. He believes the analgesia produced by these currents is due to their effect in checking the development of the diplococcus which is the cause of acute rheumatism, or in exciting the leucocytes to excrete alexines, or the general stimulating effect imparted to the protoplasm. Moreover, the effect is not produced solely by the condenser discharge but may be produced by the Roentgen ray, which has been shown to possess sedative power in the pains of malignant disease.

Becquerel rays also possess this power. Radium he does not consider suitable, but prefers thorium because its radiations are spontaneous and inexhaustible. It is also cheap, costing only ten shillings per ounce. The oxide is the most convenient salt. Its energy is dissipated chiefly by radiation. The rays are so penetrating that limbs or joints exposed to it also became radioactive. This is passed on to the deeper structures until saturation occurs, when the application of thorium should cease since the induced radioactivity of the tissues lasts a considerable time. He believes the radiations act upon the microbes of rheumatism directly, as they do upon the true parasite of malignant disease (?). The cause of the increase of pain at night in rheumatism, may be due to the fact that the microbes are nocturnal in their habits (?). He applies the thorium to the part by making a chamois pad, covered with cotton wool, sprinkled with a layer of oxide and covered by thin nainsook. The pads should be greater than the area of the part to be treated, and the application made as close to the skin as possible in order that the emanations may not be disturbed or blown away.

In a bad case of rheumatism applications should be made night and morning for a week, removing them before rising and retiring, during which time the part should be sponged and dried and the pad dried in the sunshine. Saturation takes place in a week, after which the pads are worn at night only. He has had no accidents with these applications up to date.

7. Radiology has today reached an enviable position. Radiotherapy had advanced slowly being retarded by the serious turns of early days, but its position is well recognized, and will not be lost. Radiology has made less progress in internal disorders. He divides the history of radiology into four chapters.

First, the period of mechanical interruptors and small coils giving feeble rays, imperfect radiograms and frequent burns. Second, the period of electrolytic interruptors with the Wehnelt, the variable induction, the Walter-fluorometer, and better focussed tubes, especially the heavy anticathode, and water-cooled tubes with which he had been able to demonstrate renal calculi on the screen. Third, the period of diaphragms and tube screens and the compression diaphragm by which the presence of even small calculi in corpulent patients can be positively recognized and unlimited delicacy of detail appears in negatives of the lungs, etc. Fourth, the use of the rays on internal organs.

Not only local troubles but general affections may arise from over-exposure. The eye is injuriously affected by repeated exposures. The instruments of Walter and Benoist permit one to judge the tube without the use of the hand. The various protective coatings, gloves, etc., are recommended, but operators should be careful to stand behind the tube in the zone of less rays.

In practicing radioscopy, the tube should be enclosed in a leaden case; the

various forms of tube shields are appreciated; lead glasses should be worn to protect the eyes and eyelashes. Radiography is now employed with great success in dentistry for the detection of abscesses, fistulae, etc.

8. St. Bartholomew's electrical department is placed in a separate building, about thirty-five feet square, lighted by skylight. Before the discovery of Roentgen, the work done consisted in the testing and treatment of nervous diseases, electrolysis, treatment by Apostoli's method, etc., current being derived from wet cells in the cellars. These cellars are now used for photographic dark rooms, workshop, lupus-lamps, and for the motor generator which supplies the department with direct current. There is an electric bath room, for many years the only one in London. Since the alternating current was obtained more work has been done and easier done. By means of a transformer with divided secondary a current of from one to fifty volts is available. With the advent of the X-ray this Hospital took an advanced stand and a great deal of radiographic work was done, some very good, in spite of the early apparatus.

One enthusiastic worker, Dr. Blacker, died from cancer, following X-ray dermatitis. In 1903, twelve hundred new patients attended the X-ray laboratory. Lupus is treated by the Leslie-Miller lamp designed here, ice being used as the compressor. The results are good but the great noise of the lamp is a disadvantage.

9. Campbell believes vegetable diet is at fault because of its softness which does not compel mastication and insalivation. Raw flesh is dissolved by digestive juices and need not be chewed. Vegetable food requires, if raw, abundant chewing, as shown by the grinding to which all herbivora subject their food, thus oats, being covered by a dense capsule of cellulose pass the alimentary tract unchanged if not thoroughly masticated. Animals masticate more than needful for swallowing, as is shown by the chewing of the regurgitated cud.

In man cellulose is dissolved in the colon where the liberated ingredients are inadequately digested and absorbed.

Cooking vegetable food causes the rupture of the cellulose capsules, hence less chewing is required. Lately, however, most vegetable food is so soft as to be easily swallowed without inviting the necessary mastication and insalivation, thus the jaws and the salivary glands fail to develop properly, not receiving the normal stimulus, also the stomach and intestines are flooded with crude starch, setting up indigestion and toxaemia, hence our children have small jaws, catarrhal tendencies, enlarged tonsils, adenoids and bad teeth.

Starchy foods should be consumed in a form compelling mastication; in place of porridge, give bread crusts, biscuits, and toast.

The writer believes that the modern child is made ill by being deluged with starch, and is then given malt or proprietary predigested foods. He believes adenoids to be a dietetic disease and that it will disappear if the dietary of children be so arranged as to give the teeth, jaws, and salivary glands the exercise for which they were designed.

ARCHIVES D'ELECTRICITE MEDICALE.

Bordeaux, France, August 12th, 1905.

Congress of Cherbourg. Association Francaise pour d'Advancement des Sciences. Section D'Electricite Medicale, August 3d to 10th, 1905.

1. The Present Status of Radiotherapie — Dr. J. Bergonie.
2. The Present Status of Therapeutic Applications of the High Frequency Currents — Dr. A. Zimmern.
3. The Electrical Resistance of the Human Body — Dr. Stephen Leduc.

1. As to the progress in technique, the best apparatus for producing the high tension current required for exciting an X-ray tube is the transformer devised by Gaiffe and D'Arsonval. This works without an interrupter and is superior to all others in simplicity of manipulation and perfection of electrical measurements. A powerful static machine gives a very uniform discharge but scarcely more than 1 ma., requires difficult and frequent cleansing; when the tube is hard there is a great loss by effluve from all metal parts and even through the insulators so that little power is sent through the tube. When the tube is low a great deal of the power is absorbed by the metal electrode.

As to tubes, the tubes with a water-cooled anticathode are superior in constancy rather than in quantity of radiation. The ideal tube has yet to be invented, a "monochrome" or one in which the quality of the rays should always be the same no matter what the source of current or what previous use has been made of it.

As to therapeutic measurements, there are two classes. 1. Those measuring directly or indirectly the current supplied to the tube. Gaiffe's milliamperemeter in circuit with the tube is valuable but the relation of the strength of current to the quantity and quality of radiance is a complex one and the milliamperemeter gives no direct indication. 2. Those measuring the radiations from the tube; Holzknecht's chromoradiometer, Labouraud and Noire's radiometer and Kienbock's radiometer are all valuable but they are not perfect. To distinguish between fine shades of color is often difficult even for a trained eye, and then again there is the effect of ordinary light upon the test objects, and some are sensitive to other radiations from the tube besides the X-ray (Galimard and Bordier). Finally the sensitiveness may vary with the time, the exposure and previous use of the test object. But is it not certain that rays of a high degree of penetration (8 or 10 Benoist) which are very little absorbed by these test objects have only a feeble effect upon them? But the radiation from an X-ray tube is very complex and we cannot deduce from the effect produced by the few rays which in such a case act upon the test object any accurate measure of the remainder of the radiation. Especially is this the case when a variety of sources of current are employed.

As to the results obtained by radiotherapy. They are very fine in all cutaneous affections and particularly in superficial epithelial neoplasms. No other treatment can be compared with it in the perfection of the cicatrices, the rapidity of the results, and the innocuousness of the application. Myelogenous leucemia is equally favorably affected. But it is not the same with malignant tumors with rapid or slow generalization. "In cancer of the breast, operable, with rapid invasion, in a young woman before the menopause, radiotherapy cannot at present show any established successes, complete and lasting for more than a few months. In cancer of the breast, non-operable, in a young woman, radiotherapy is a palliative treatment diminishing or suppressing pain, closing superficial ulcerations, removing the fetor of the ichorous discharge or even drying it up. But it does not prevent general involvement sooner or later. In cancer of the breast, recurring after operation, the same conclusion if the woman is young; the results are perfect at first, the cicatrix becomes flexible, the epithelial nodules flatten out and disappear, the glands can no longer be felt; but generalization takes place, cough announces the mediastinal invasion and one can only delay, not prevent, a fatal termination. In scirrhus in old women and in certain torpid forms of tumor of the breast the results are much better. The X-ray will keep the patient for a long time free from pain, ulceration or any progress of the

disease. It is distinctly indicated in such cases."

"It is difficult to say just how effective the X-ray is in preventing or delaying recurrence" (used as a prophylactic after operation). In rapidly progressing inoperable sarcoma of the extremities it has a palliative and retarding effect. internal neoplasm should be treated in this way but not even a small percentage have thus far been cured. In cancer of the uterus he had always except in one case seen rapid generalization in spite of X-ray treatment. It had only lessened the suffering and the discharge. In the one exceptional case the patient was a young woman, non-operable, the treatment was applied energetically both by the speculum and externally with the production of intense dermatitis (depilation and desquamation). The disease was entirely arrested for a year and then began to develop again. But of seven cases of cancer of the tongue, all inoperable, he has after eighteen months only one that is doing well and that one is not free from all peri-lingual induration. Tubercular glands present favorable results and the treatment is clearly indicated especially in cases without a tendency to suppuration.

2. It is only fifteen years since d'Arsonval introduced high frequency currents into therapeutics. It is almost with a feeling of pity that we compare the apparatus with which our earlier work was done with the present powerful apparatus of the d'Arsonval-Gaiffe type. It seems almost as if the benefits experienced by the earlier patients must have been psychic, but still psychic influences would not have cured fissure of the anus or hemorrhoids. With the new apparatus a case of pruritus requires hardly more than three or four treatments. Lupus erythematosus, fissura ani, and hemorrhoids are well established indications for treatment by high frequency currents.

Marque, Delherm and Laquerriere, and Allaire have written excellent reviews of the work along these lines. Physiological action from high frequency currents has been disputed by W. Fromure and he attributes all the benefit to suggestion. And it may be that the improvement in neurasthenia is partly due to this cause. But this is not the case in gout and obesity, or with the lowering of the arterial tension in cases of hypertension. High frequency currents afford a means of keeping the arterial tension at its normal value and of opposing arteriosclerosis and its complication, cerebral hemorrhage. In twenty such cases Gay has observed in 1, notable lowering of the arterial tension; 2, acceleration of organic oxidations with an increase in urea, uric acid and chlorides in the urine; 3, a very evident influence upon the condition of the walls of the arteries with dimished vasoconstriction. Laquerriere and Delherm have observed that the autocondensation couch or the autoconduction cage give a much greater amplitude to the capillary pulse. Oudin found that the arterial tension was affected by local applications. "The effluve from the resonator produces, as can be shown by an apparatus registering capillary pulse, a vasomotor spasm characterized by a lowering of the general curve and a diminution in the amplitude of the pulsations. After the cessation of the effluve the capillary pulsation rapidly resumes its original amplitude and exceeds it a little; and for several hours it undergoes periodical fluctuations" (Oudin). The author (Zimmern) has recently performed the same experiment and found that after local application the fluctuations in blood-pressure on the return to normal are very marked; and concludes that the local effluve produces a very powerful general action upon the bodily exchanges.

The condenser electrode, of course is useful for applying fine sparks in eczema, lupus erythematosus, and anal affections.

But it is also very useful as a revulsive. For this purpose it is very easily controlled, and treatment can be repeated every day or several times a day without injury to the skin, of course providing the current is not strong enough to puncture the glass. It may replace the thermocautery for the painful phenomena of chronic arthritis and even in subacute arthritis as an adjunct to galvanization and the introduction of salicylic ions according to Bergonie's method; and especially in muscular contractures either idiopathic or in connection with subacute arthritis (gonococcic or tubercular). The sparklets from a condenser electrode also have a marked trophic effect as seen in the successful treatment of scleroderma.

The effluve has a curative effect in certain infectious dermatoses (blennorrhagia, tuberculosis). Oudin attributes this much less to a direct action on the microorganism than to one which augments the defensive power of the economy, notably the process of phagocytosis. And the ultra-violet bathing of the diseased tissues is very important. In tuberculosis in Guinea pigs Desnoye found that "if the effluve does not prevent the generalization of the infection the progress of experimental tuberculosis finds itself exaggerated in a certain measure." As to local tuberculosis, glandular or osseous if the lesions are sufficiently superficial the effluve has a most favorable action. It is the same way with sluggish wounds and ulcers. The latter very soon become covered with granulations, the callous borders flatten out and cicatrization advances with surprising rapidity. Localized forms of pruritus, however, yield very much more rapidly to X-ray treatment.

The spark from a metallic electrode is of value in angiomatus spots, tubercular lupus and small cutaneous neoplasms. For flat angiomata Bergonie applies an aigrette of very numerous small sparks, the tissue becomes pale after a few seconds of this application. This is followed by an inflammatory reaction which results in a cure of the subcutaneous condition with more or less decolorization of the epidermis. Strobel of Munich finds that active sparks cure lupus and malignant tumor of the skin in a very short time and with a perfect cicatrix. His application is by a pointed metallic electrode from the Oudin resonator held at a distance of 1 or 2 mm. from the surface; the sparks pass uninterruptedly radiating slightly about a center. After about 5 seconds the skin blanches, the epidermis is shriveled or fissured and the blood-vessels are all constricted. The spark is allowed to act for 10 or 25 seconds. There is an inflammatory reaction succeeded by elimination of the morbid tissues and a slightly depressed cicatrix at first red but which soon becomes indistinguishable from the sound skin. Strobel attributes to the spark a mechanical, electrolytic and thermic action. The destruction of the vessels surrounding the lupoid nodules results in their death from lack of circulation, they act as foreign bodies and are eliminated. The same treatment has given brilliant results in some rosacea and in lupus of the mucous membranes. Bordier has obtained equally good results, the treatment is hardly painful at all and an epithelioma of ordinary size requires only one application of a few seconds duration; the cicatrix is much less visible than that from an electrolytic needle. But phototherapy and radiotherapy (X-ray) are indicated where the epithelioma extends over any extent of surface.

Oudin's technique for this application is excellent. A conical metal electrode is used, like Doumer's rectal electrode. The high frequency apparatus is adjusted with a spark gap of only 2 or 3 mm. and the current is then turned on. The operator takes the metal electrode in his grasp with his right hand and with his left hand holds the patient's hand. The point of the electrode is placed in contact with the skin and a little shower of pain-

less sparks may be seen (if the room is dark) passing from the surface of the electrode to the skin. After moving the electrode over the tumor for about a minute, let go of the patient's hand; the sparks become larger but are not painful. When the surface touched begins to pale separate the point a little from the tissues. The sparks thus become longer. Finally move the right hand back so that it holds only the insulating handle of the electrode, and the sparks reach their maximum length and can be distributed over the affected area. A strength of 60 ma. is applied.

3. A double current exists of anions toward the positive and cathions toward the negative pole and their double movement constitutes the electric current. At each surface the different chemical media exchange their ions and thus modify their composition. These exchanges of ions seem to constitute the principal physicochemical reason for all the physiological and therapeutic effects of electric currents, effects dependent upon the nature of the ions, their number and their movements. In another article Leduc has shown that the moistening and the vascularization of the skin which has been depended upon to lessen its resistance produces practically no effect. In fact the intense anemia produced by the electrical introduction of adrenalin lessens instead of increasing resistance. The resistance of the skin depends on 1, the nature of the ion introduced; 2, the degree of saturation by that ion; 3, the voltage; 4, the region of skin where this resistance is measured; 5, the dimensions of the electrodes. He has also shown in another article that the electrical resistance of the skin does not vary inversely as the area but is connected rather with the periphery of the electrodes.

If one electrolyzes a solution of sodium chloride with two platinum electrodes the resistance of the electrolyte diminishes, and with an invariable voltage, the amperage increases exactly as in the case of a current traversing the human body. Sodium hydrate is produced at the cathode, hydrochloric acid at the anode, this introduces into the solution ions OH- and H+. These ions move much faster than the ions Ce- and Na+ and in proportion as the number of ions OH- and H+ increases the resistance of the electrolyte decreases. Briefly the lessened resistance is due to the substitution of rapid ions for slow ones. The great resistance of an electrolyte may be due to the small number of ions or to their slight mobility.

Both these factors are present in the skin but especially the second, the ions in the skin are large and complex and not easily moved. Under the influence of the current simpler and more mobile ions are carried into the skin from the electrodes and from the deeper tissues and the resistance correspondingly decreases. The number of active ions may be reduced by the electrical introduction of the metals of the alkaline earths, precipitating most of the carbonic, sulphuric and phosphoric ions, and in this way the resistance would be increased.

The effect of ions upon the albuminoids of the body and the resulting change in the electrical resistance is illustrated by placing blood-serum in a U tube closed at each end with gold-beater's skin and using acid solutions as electrodes. The current carries H ions into the serum which does not lose its transparency but acquires the consistency of liquids. From 0° to 100° C. the resistance diminishes one-half for each 3 degrees. At 100° C. the resistance is only 1/33 of what it is at 0°. This decrease is uniform, not affected by coagulation.

An experiment which illustrates the varying resistance of the skin (which is a highly resistant electrolyte placed between two good conductors, the deeper tissues and the electrode; and which receives ions from both) is as follows: Two U-shaped tubes filled with NaCl 1/10000 and closed at both ends and

dipped into NaCl 1/100 at each end. An electric current is passed through one continuously and every half hour the electrical resistance of each tube is measured. The resistance in the tube through which the current is passing diminishes much faster than the resistance in the one which shows only the effect of the gradual diffusion of the liquids without the aid of ionization.

ARCHIVES D'ELECTRICITE MEDICALE

Bordeaux, France, August 25th, 1905.

1. The Regeneration of Barium Platino-Cyanide Screens — Dr. Bordier.
2. The Physiological Effect of Franklinization — Prof. Auguste de Luzenberger.
3. The Treatment of Tubercular Adenitis by the X-Ray —Dr. Rene Desplats.
4. First International Congress of Physiotherapy — (Liege) — August 12-15, 1905.

Resume of the Sessions of the Section on Medical Electricity.

1. Barium platino-cyanide changes from its original apple green color and brilliant fluorescence to a dark orange or brownish yellow color with scarcely any fluorescence. This change in color forms the basis of the radiometer introduced by Labouraud and Noire. It also takes place in fluoroscopic screens and in both cases it is very essential to be able to restore its original properties to the barium platino-cyanide.

(1.) The change is due to a process of dehydration, ordinarily under the influence of the X-ray, but it may be produced by enclosing the screen and an open dish of sulphuric acid under a bell-jar or by simple heating. The action of the X-ray is probably by ionization, abstracting water in this way from the crystals.

(2.) The conditions favoring the return to its original condition are, generally speaking, exposure to light and moisture. It takes place instantly if the crystals are dissolved in water. If both surfaces of a screen or test wafer are varnished with copal this rehydration cannot take place, but it does take place slowly in cases where the barium platino-cyanide is incorporated in a coating of collodion. The worst cases of over-browning of screens comes from exposing them to the direct rays of the sun in an effort to restore them. The heat is so great that the screen is spoiled for all practical purposes until it has been restored. The effect of exposure to light in causing regeneration of only moderately-affected screens may be due to a photochemical effect causing the separated ions of hydrogen and oxygen to recombine and form water.

(3.) All the other platino-cyanides (of ammonium, magnesium, and potassium) undergo changes of color and loss of fluorescence in the same way and are restored by the same means. In the case of the magnesic salt simply breathing upon it instantly restores the original color.

(4.) How to restore a screen which has been burnt so to speak. If it is varnished the only way is to break it up and redissolve the salt. Otherwise all that is necessary is to moisten the back of the screen so that the crystals may absorb through the card board sufficient water to restore their original properties. It is to be hoped that manufacturers will in future make screens by simply allowing the crystals to dry on card board and protect the same by a piece of glass fastened over the fluoroscopic surface.

2. There is no essential difference between electricity produced by friction and that produced in any other way, and we are able now-a-days to produce the same high potential from a galvanic battery by means of suitable transformers and condensers, and also to produce an electrostatic charge, as distinguished from a current. Franklinic electrization produces, on account of its low amperage, practically no electrolytic effect. The

patient cannot be charged at all unless he is completely isolated, which is quite different from the case of the Tesla or d'Arsonval transformers, where Herztian waves and other oscillations completely charge the patient whether he is insulated or not.

Both varieties of high tension electricity break down the resistance of the air and charge a person at a distance, but the high frequency apparatus will do this at great distances while a static machine will do so at a distance of only a few centimeters. The positive ions are larger and heavier, but it is only the negative ions that can travel alone. The positive ions are always accompanied by negative ones.

Machines are made now-a-days giving a tension of 347,700 volts and they serve not only for static treatments but also for exciting high frequency apparatus and X-ray tubes. For office use a machine with two 70 or 100 cm. plates (25 to 36 inches) is sufficient. An influence machine in its successive phases represents a Gramme ring. Ebonite plates are most used in Europe but the author prefers glass ones.

Static electricity produces chiefly an electro-mechanical effect upon living organism, galvanism chiefly electro-chemical. Capriati subjected tadpoles to Franklinization and found that they developed more energetically and rapidly than the control animals. And Picciano who watched the development of silkworms under different forms of electricity found that the product of those subjected to Franklinization was superior to that of silk worms which had been subjected to high frequency currents or which had developed under ordinary conditions. Pisani and Montuoro demonstrated by very delicate experiments that the thermogenesis of the human body increases sensibly during and for some time after each Franklinization. The author has often seen cardiopathies calmed after a few static treatments; mitral murmurs of spasmodic origin stopped entirely by a series of static treatments with the effluve concentrated on the cardiac region. In the same way hypertension of the arteries is reduced. Laquerriere has even seen hypotension raised in arteriosclerosis. As long ago as 1748 Sallerbert noticed in a certain case an acceleration of the pulse from 80 to 94 and saw a phlebotomy wound which had ceased to bleed recommence after a few minutes of Franklinization, and give a stronger jet than before. The pallor and subsequent redness of the skin at points where sparks have been applied show the vasomotor action.

There have been no direct experiments upon respiration; but it has a very great effect upon what might be called the respiration of the tissue cells. In diabetes, oxaluria, uricaemia, the brilliant results obtained are due to an increase in the vitality of the cells and in their chemical exchanges. Glands for example produce increased secretion. Thus anachlorhydria of the stomach or deficient intestinal secretion are benefited and he cured a neurasthenic with meteorism caused by anachlorhydria by a static aigrette over the stomach. The muscular fibre of the abdominal viscera is notably affected by the aigrette and more powerfully by the spark; and intestinal atony is cured if the patient has the perseverance to undergo a long course of treatment.

For relaxation of the pelvic muscles more than for the bladder the method of choice is the intermittent galvanic current; but the static benefits the uterus and several cases of chlorosis have been cured by this treatment alone. Cutaneous eruptions improve rapidly with the static breeze; eczema, herpes, and even burns are radically modified in their progress, and there is an immediate effect on the pain accompanying them. Capriati and Pisani have shown by the ergograph that fatigue shows itself much later in Franklinized muscles than in the normal state.

Of course other stimulants have a similar effect.

The muscular contraction produced by applying a spark to a muscle has lately been used in electro-diagnosis and this has been found to take place even in certain cases where other electrical modalities have no effect (Zeiber, Ballet, Zolly). Many neurotics with insomnia which does not yield to the usual hypnotics are cured by the static bath or if necessary the static head-breeze. It is the same with patho-preoccupations even "idees fixes." The sedative effect is obtained by a local breeze, as in neuralgia; or by the general bath, as in neurasthenia, insomnia, the pseudomaniacal excitement of hysteria. The stimulating effect is produced by aigrettes or still more by sparks, as in hysteria anaesthesia, muscular debility of diathetic origin (diabetes, arthritism) but he always adds the static bath. While the positive charge is richer and more resistant upon the body charged and is therefore preferred, he has not been able to see any difference between the effects of the two polarities. It is important that we should have some means of determining the intensity of the charge.

3. Desplats has treated tubercular glands without much success by means of the galvanic current, Franklinization and the high frequency effluve. But he has succeeded very well with the X-Ray.

Case I.—Man fifty years old, suppurative glandular mass the size of a small orange on the right side of the neck in the carotid region, with small glands under the chin and at the base of the neck on the same side. The trouble began a year previously. From August 1 to 16, 1904, under treatment by high frequency effluve, slight diminution in volume occurred and several fistulae formed. Then X-Ray treatments of ten minutes on each of the glands with No. 7 (Benoist) rays, each seance corresponding to about 8 H. August 30th there was an abundant serous discharge and a very appreciable reduction in size. Three similar applications were made on this and the two following days and on September 14th there were erythema, alopecia and a still more abundant discharge, corresponding to a great reduction in size after expression. September 14th, 15th, and 16th, applications amounting to 10 H. This was followed by a dermatitis which prevented any X-ray treatment, about the first of October. All that remained at that time were some little fistulae exuding a little serum and which closed in a couple of weeks under a mercurial salve. All treatment ceased October 12, 1904, and there now remains only some fibrous nodules at the points originally affected.

Case II.—A young man of 19, glandular mass the size of a mandarin orange at side of neck and without a tendency to suppuration. Also smaller glands. Number of red blood cells 4,120,000, white 11,270. Cacodylate of soda internally and X-Ray 8H at each locality divided into two sessions May 16, 1905, and May 17th. On June 2d there was wonderful reduction in size, and the treatment was repeated. June 17th, skin a little brown and some desquamation. 4 H. applied on each side in divided doses. July 5th patient is considered cured. There are small very hard glands to be felt. Red blood cells 4,960,000, white 6,820 (at height of process of digestion).

MISCELLANEOUS ABSTRACTS

ELECTROTHERAPY

THE HIGH FREQUENCY SPARK IN A XANTHOMA-LIKE DEGENERATION OF THE LIPS

Charles Warrenne Allen, *Medical Record,* Sept. 28, 1905.

Several years ago Allen found that the high frequency spark would remove permanently, satisfactorily, and practically painlessly xanthoma tumors from the neighborhood of the eye. He was struck by the resemblance between the condition about the eye and yellowish white discoloration of the vermilion borders so frequently found on women's lips that he began to apply the high frequency spark to these conditions and with good results. In two of his patients there was coincident xanthoma of the eyelids which was also cured in the same way. He uses a static machine to excite a Piffard hyperstatic transformer, employs a spark gap of two inches and applies the treatment by means of a large carbon electrode through a contact spark of about 1/8 of an inch, or one which will cause almost at once a marked whitening of the lips. Two or three sittings is usually sufficient. This observation is valuable inasmuch as almost no other methods of treatment have ever been of any value in lessening or removing the condition, which, in some cases develops into a disfiguration of considerable gravity.

ELECTRICAL TREATMENT OF TRACHOMA

N. Bishop Harman, *British Medical Journal,* Aug. 26, 1905.

Harman reports four cases of trachoma which were treated with the X-rays. None of these cases showed any improvement, although in one 50 sittings were made in five months, it being subsequently necessary to resort to the use of bluestone for the cure of the case. Seven cases were treated with high frequency currents and did not improve at all. Three cases were treated with radium, one of the cases having 139 applications during 6 months, but in none of them was any change for the better apparent.

Marshall and Drake-Brockman in discussing the paper expressed their disbelief in the efficacy of electrical or radiological applications in the treatment of trachoma. They had used the treatment themselves and watched it as applied by others but had not seen any satisfactory results.

The technique of the applications used was not given.

RADIODIAGNOSIS

A LECTURE ON THE X-RAY DIAGNOSIS OF RENAL CALCULUS

Morton Smart, *British Medical Journal,* Sept. 16, 1905.

Smart considers the factors which determine the element of success in the Roentgen ray diagnosis of renal calculus to be, first, the size of the stone; second, the composition of the stone; third, the size of the subject under examination; and fourth, the condition of the kidney. A small stone offers much less resistance to the rays than a large one and the

shadow therefore might be so light and small as to be easily missed.

Stones are divided as regards their composition, into three groups, the acid group, alkaline group, and bacterial group. Pure uric acid stones offer little obstruction to the rays and therefore are difficult to detect; fortunately these are rare. The oxalate of calcium stones throw the densest shadow, and the uric acid stones combined with the oxalate or phosphate of calcium, which are said to occur most frequently, come somewhere in between.

It is easier to find calculi in the kidneys of children than in those of adults and easier in a thin person than a fat person, because the more tissue that surrounds the calculus the less differentiation will there be between it and this tissue.

The condition of the kidney as regards induration or the presence of pus has an important bearing. The indurated kidneys of chronic interstitial nephritis offer a considerably increased resistance to the ray, and masses of pus produce such a shadow as absolutely to obscure the shadow of the calculus in many cases. The most serious cause of error, however, is probably the presence of calcareous glands in the neighborhood of the kidney and ureter. This can only be excluded by the use of the ureteral bougie as recommended by Mr. Hurry Fenwick in a recent number of the British Medical Journal, abstract of which article will be found on page 164 of the September, 1905, issue of THE ARCHIVES. The presence of gas in the bowels will also sometimes seriously embarrass interpretation of the shadows.

Smart's custom is to administer a strong purgative first in order to empty the bowel, and give a rectal enema a couple of hours before the photograph is taken. All clothing should be removed from that part of the patient's body which is to be represented on the negative, and a flannel binder placed around the abdomen to restrict the movements of breathing as much as possible, as these will blur the plate, the kidney moving somewhat during respiration. Another method of accomplishing this end is to place the patient face downwards on a canvas-topped table, place the plate on the back, and locate the X-ray tube underneath. To get the back as straight as possible an air-tight cushion is placed between the canvas and the abdomen; this cushion also to a great extent eliminates the respiratory movements. "The anti-cathode is located directly over the middle line at the level of a point between the umbilicus and the lower end of the sternum." He takes both kidneys and both ureters in each negative because sometimes the stone has been on the opposite side from that suspected. The plates should be large enough to take in the transverse processes of the ilia and the lower ribs; that is, in adults, about 11 by 14 inches. If a stone is suspected from the first negative another should be taken two or three days later under as nearly similar conditions as possible.

Sometimes flaws in the film of the plate and shortcomings in developmental technique will cause a shadow to appear which might be mistaken for a calculus. This can be obviated by using two plates one placed on top of the other; if the shadow is a flaw in one plate it will not show in the other. He also speaks most favorably of the use of stereoscopic roentgenography in these cases.

From his extensive experience Mr. Smart concludes as follows:

"1. That the method is an extremely useful auxiliary to the ordinary methods of diagnosis.

"2. That the method should be resorted to in every case of suspected stone, and that no operation should be decided upon until the case has been carefully photographed.

"3. That the method entails a great responsibility and should in every case be carried out with the greatest possible care, for the patient's sake as well as for

the operator's reputation, as a mistake may lead to such serious consequences.

"4. That the great increase in the power of the apparatus used, and the increased knowledge of how to obtain the best results, will soon enable X-ray specialists to exclude all doubt in the interpretation of a negative.

"5. That in cases where the negative shows the shadow of a stone and an operation is decided upon, the patient should be re-photographed under as nearly as possible similar conditions a day or so prior to the operation. I consider this necessary, because in one case a patient was photographed and a diagnosis of renal calculus was made. The operation took place sometime afterwards, and no stone was found in the kidney. Another photograph was taken shortly after the operation, and the stone was again seen, but this time it was in the ureter. During the interval between taking the photograph and performing the operation the stone had moved downwards.

"6. Lastly, I think every case should be taken stereoscopically at least once."

ONE OF THE CAUSES OF IMPERFECTION IN THE RADIOGRAPHIC IMAGE

Henry Power, *Jour. A. M. A.*, Sept. 30, 1905.

Power reports and illustrates certain experiments performed by him to determine the cause of some imperfections observed in the X-ray image. In one, different portions of the photographic plate were exposed in different ways. In one part the exposure was made in the usual way; another portion was exposed at the same time, but a sheet of lead one-sixteenth of an inch thick was interposed between the object and the target, producing a fainter image, and over another portion of the plate, and in apposition to it, narrow lead strips were interposed. The shadow under the strips was much denser than that under the suspended sheet lead, though the thickness of the lead was the same in each case. The inference, therefore, is that the rays must have passed around and not through the suspended sheet lead.

If this be so, three suppositions are possible: (1), The rays may come from some source in the tube remote from the target, i. e., accessory rays. (2), They may have been bent from their normal straight line, i. e., refractory rays. (3), They may have been produced by the action of the well-known rays from the target, i. e., induced rays.

That they are not accessory rays he considers proved by the experiment of giving a long exposure to a plate inclosed in a lead box with only a pinhole aperture, and which revealed only the image of the target, or more particularly its central active portion, though other portions of the plate must have been exposed to rays emanating from any other parts of the tube. He concludes, therefore, that the interfering rays in X-ray work are produced in one of the two other ways, and probably by the regular rays inducing new rays.

RADIOTHERAPY

A CASE OF CHRONIC PYOGENIC ONYCHITIS CURED BY THE X-RAY

G. E. Pfahler, *Journal of Cutaneous Diseases*, August, 1905.

The patient was a woman 50 years old, who had had intermittent attacks of "run-around" since she was 16. The last attack for which Roentgen therapy was applied had existed for four years, resisting various kinds of treatment, including mercury and potassium iodide internally. Roentgen therapy was be-

Figure I.
Before treatment.

Figure II.
After treatment.

Illustrating abstract of Dr. Pfahler's article on Onychitis.

The Archives of Physiological Therapy—November, 1905

Lupus vulgaris of six years' duration.
Before treatment.

After two years' treatment.

Illustrating abstract of Dr. Schamberg's article on Lupus Vulgaris.
The Archives of Physiological Therapy — November, 1905

gun February 27, 1905. "At this time the matrix of the thumb and second finger were a deep red color, swollen, indurated, and tender. This condition extended backward as far as the first joint. The nails were lost and the bed of the nail showed a very ragged appearance, and many small pustules (Fig. 1). Cultures and cover-glass preparations made from this pus showed nothing but staphylococci.

"X-ray treatment was given three times a week, with the tube six inches distant, a 2½-inch vacuum, and five minutes' exposure on each finger, using about one milliampere (Roentgenammeter) through the tube. Improvement was noted after two weeks. There were fewer pustules, less pain and less swelling. Between February 27 and May 10, 1905, there were 25 treatments given. At the end of this time she is apparently well. No pain, no tenderness or swelling are present. The skin is smooth and almost of the same color as the surrounding skin and a new nail is forming (Fig. 2). The nail has continued to grow one month after the last treatment."

This case, which appeared to be due to a mild but persistent infection by the staphylococcus, is significant because it yielded in three months to Roentgen therapy after having resisted all other treatments for four years, and indicates that the Roentgen ray may prove to be of value in other chronic pyogenic infections.

SUCCESSFUL TREATMENT OF AN EXTENSIVE LUPUS VULGARIS WITH THE X-RAYS

Jay F. Schamberg, *Journal of Cutaneous Diseases,* September, 1905.

The patient was a woman aged 31 of tuberculous ancestry. In February, 1898, she "noticed a small, pea-sized swelling on the right side of the face below the zygoma, which was freely movable beneath the skin. This was excised by the attending physician and packed with iodoform gauze for about five months. About this time a young woman, who was said to be suffering from consumption, visited the patient and occupied the same bed with her for several weeks. In November of 1898 the wound which was unhealed was excised with a portion of the parotid gland. At the same time a small patch which had appeared on the ala of the nose was curetted. The disease, despite this, spread on the nose and a second curetting was performed. Following this there was temporary benefit, but the disease remained unchecked. At about this time the mucous membrane of the nose became involved, and a focus of disease appeared upon the right cheek. Later the patient had nervous prostration, and during this period treatment was neglected. Subsequently the left cheek became involved and the upper lip and right ear showed evidence of disease."

In 1903 a gland became enlarged on the left side of the neck which suppurated and was followed by necrosis of the overlying skin. No signs of tuberculosis were present except a slight cough which appeared in the spring and disappeared after a sojourn in the country. When the patient first came under Dr. Schamberg's observation the appearance presented was that shown in the illustration. She was first treated with the Finsen light in the Philadelphia Polyclinic laboratories, (London Hospital lamp being employed) which failed to give satisfactory results and roentgenotherapy was substituted.

"A medium soft tube was employed at an average distance of seven inches; the average duration of the exposure of each area was six minutes. In all, three hundred exposures were given in the course of almost two years. This does not represent three hundred sittings, as two or three separate irradiations were often given during one sitting in order to

expose all of the affected areas. The treatment was interrupted from time to time for various reasons, so that it would occasionally happen that the patient would not receive any irradiations for a month or two. On several occasions a distinct erythema was produced, but the reaction never went beyond this degree. Many of the lupus nodules underwent suppuration before disappearing."

By April first, 1905, the greater part of the area was covered with a smooth pliable scar. The tip of the nose had been destroyed but removal of a portion of the septum which projected beyond the alae and which had united to an ulcerated portion of the lip very much improved the appearance of the nostrils. "The lower portion of the right ear is the only region which still exhibits the presence of undoubted lupus tissue. The lip is entirely healed, the nasal mucous membrane is reddened and sensitive to atmospheric changes, but appears to be free of actual lupus elements." Although the patient is not completely cured Schamberg considers that ultimate complete recovery is only a matter of time.

INDICATIONS FOR ROENTGEN-THERAPY

W. Lehmann, *California State Medical Journal,* Sept. 1905.

The ill effects of the Roentgen rays are due to a certain accumulation. The sooner the reaction follows a given treatment the more grave it is. The more serious the existing dermatitis the longer it lasts. A simple erythema-like redness, preceded usually by a brownish pigmentation, with or without swelling of the skin, with epilation and with more or less pronounced subjective symptoms, such as itching and burning, beginning two or three weeks after beginning treatment, will stay only a few days to a week, will not produce other symptoms, and is usually considered a reaction of the first degree.

Given the same quality of light, a double dose will give a reaction of the second degree, beginning after 10 days with the same symptoms, but soon followed by the formation of large bullae, peeling off of the skin, and serous secretion. While the first condition disappears in from 5 to 8 days this second condition needs 2 weeks or more to heal up completely. No scars will be formed but later on, sometimes, a superficial atrophy of the skin, with telangiectases, will appear.

A burning, an ulceration needs a dose about four times as great as the first, is very refractory to any form of treatment and requires months to heal up. This condition should never occur in trained hands.

In order to obtain the necessary reaction, it is not only the shortest but also the safest way to give the whole dose at once and then wait. This is the given treatment in skin diseases.

In deep seated affections, a high vacuum tube is used at a greater distance and at many short intervals.

Diseased hairs fall more easily than healthy ones, and therefore the rays can be used in all diseases needing epilation.

"Hypertrichosis of women's faces should not be subjected to the modern roentgenotherapy."

In conclusion the author recommends a more extensive use of this new therapeutic agent, but at the same time warns against the careless handling with dangerous overdoseage and against leaving this two-edged sword to untrained hands.

THE FAT OF TOP MILKS

Joseph W. England and Charles H. La Wall, *Journal of American Medical Association,* September 23, 1905.

The use of top milks in infant feeding is rapidly increasing, and it seemed advisable to examine the typical milks of the Philadelphia milk market for their percentages of fat.

The formulas for milk modification with top milks are all based on the use of top milks taken from one-quart bottles, and not from one-pint bottles, and these experiments show radical differences in the fat percentages of top milks as taken from each.

The quart bottles vary in height from 8⅛ to 9⅞ inches, in outside diameter at the base from 3½ to 3¾ inches, and in inside diameter at the neck from 1¼ to 1½ inches. While small, in some instances, the size and shape of containers exert an important influence in creaming, or the production of the top milks, more so than the difference in size and shape would apparently indicate.

Milk is generally at least sixteen hours old when delivered.

While the amount of cream is governed by the amount of fat in the milk, the shape and size of the container, and the length of time the milk has stood, are factors of equal or greater importance. Creaming, that is, gravity-creaming, is the separation or raising of the fat globules to the surface of milk. It is mechanical in action. The more narrow and cylindrical the container the readier the creaming, and the more dense the upper layer; the broader the container the less ready the creaming and the less dense the upper layer. This is shown by the differences in the creams obtained from an open pan and from a tall cylindrical bottle. The height of the layer of cream in a bottle varies from 2½ to 4 inches. As a rule the less high the creamy layer the denser and richer in fat.

The fat globules are suspended in the milk. It is generally believed that each globule is surrounded by a thin nitrogenous membrane, proto-plasmic in origin, which becomes ruptured on churning. This theory is by no means universally held today. Babcock and many others believe that milk is simply a natural emulsion.

The length of time a milk has stood before the top layers are removed is a most important factor. One half-ounce of top milk, 16 hours old, assayed 17.6 per cent. fat, and 24 hours later another half-ounce of top milk from the same bottle assayed 26.4 per cent. It should have assayed much less, as the richer layer had previously been removed.

The percentage of fat in whole milk varies greatly. In these observations the average percentage of the upper half-ounce of a quart bottle was 24.00 per cent., of the upper ounce 22.00 per cent., of the upper two ounces 21.75 per cent., of the upper four ounces 18.80 per cent., of the upper six ounces 15.80 per cent., of the upper eight ounces 13.20 per cent., of the upper twelve ounces 9.60 per cent., of the upper sixteen ounces 7.00 per cent.

The richer the upper layers of top milks in fat the poorer the lower layers.

Many of the formulas in general use are based upon those given by Dr. Joseph E. Winters in an article, "Feeding in Early Infancy; Home Modification of Milk," published in the *Medical Record,* March 7, 1903, p. 366.

The quart bottles of the Philadelphia milks follow Winter's standards very closely for the upper one-half ounce, one ounce, two ounces, and four ounces. Above that the differences are wide.

The pint bottles should never be used for obtaining the top milk for infant feeding, because the differences in fat percentage are too great.

The use of diluted top milks from one-quart bottles for the very young is not attended with such serious differences of fat percentage as the differences in the fat percentages of the undiluted top

milks might imply or as to justify the disuse of top milks. At the same time it must be borne in mind that the percentages of fat in cow's milk are most variable. Apparently the best results in top milk infant feeding are to be had by approximating percentages; that is, by having them reasonably accurate, and then adjusting, if necessary, the relative proportions of top milk and diluents to suit the individuality of the child.

ON THE FEEDING OF THE SOLDIER ON ACTIVE SERVICE

Surgeon-Lieut.-Colonel G. S. Robinson, *British Medical Journal,* August 19, 1905.

His food influences both the soldier's efficiency and his comfort.

1. *Food.* Meat, if killed shortly before it is issued, is less tender than if it has been kept twenty-four hours before it is used. Meats canned in tin make an agreeable variety. Tinned rations containing a large proportion of vegetable and broth are useful as a means of varying the menu, although not popular with the men, perhaps because too highly seasoned. Biscuits [crackers] of various kinds help to make variety, but bread should be issued whenever possible. Men miss it greatly, and will do anything to obtain it. A portable bakery should accompany troops and be made use of at every opportunity.

2. *Drink.* Men, when thirsty, will drink the water most accessible, whatever its quality. The soldier should be taught to realize that the constant drinking of dirty and tepid water is not only injurious, but fails to relieve thirst, and that the initial craving can be controlled with a little resolution. Colonials drink nothing but tea at their meals, and to this is probably due their immunity from bowel complaints. Water bottles should be filled with any weak tea remaining. This is less objectionable than water, when it becomes warm in the bottle on the march.

3. *Cooking.* It is to cooking that we must look to get the most good from the rations, and ensure the variety which is essential to the well-being of the men. It is the almost universal practice to stew the meat. The dried vegetable ration may be added. But a more agreeable addition consists of peas or beans. A roast or baked meat seems almost a necessity, but this seems almost unattainable. A large portable oven on wheels would be a great boon, because it would permit not only of greater variety in cooking the meat, but also of baking bread. In addition to the company cooks, every fully-trained soldier should himself be able to turn out something tasty in the way of supper. The mere lighting of a small fire is an art in itself to be cultivated.

A quartermaster-sergeant of Royal Artillery, who was three years in South Africa, writes: "We seemed to get on better by messing in small batches, say, of four or eight men. Give these batches their own tea, coffee, sugar, meat, etc., and let them cook for themselves. The men were far more contented and better fed, and they appeared to enjoy the preparation of the meal. The fuel difficulty was overcome in this way too, as each batch 'scouted' round for their own wood, instead of an irksome fatigue having to be formed for wood cutting."

4. *Serving.* The right time for serving the different meals is a matter of special importance. No good work can be got out of men until they have breakfasted. Lunch from food saved from the day before should be eaten in the middle of the day. On arriving in camp tea may be served, which refreshes the men, and after the dinner has been prepared, it may be enjoyed in the cool of the day.

5. *Hospital diet.* The suggestions already made apply with greater force to the feeding of the sick. Fresh meat should be obtained for those who require it. Special biscuit should be provided

for men suffering from fever or bowel complaint. Those made from arrowroot or fine flour could often be used. Rice, so easily prepared and digested, is also useful. For convalescents tinned chicken and rabbits are the most appreciated and most suitable diet. The unsweetened form of tinned milk should be provided for those who cannot take the sweeter forms of condensed milk.

The great difficulty is to get good cooks. A large number of orderlies and other soldiers should be specially trained as cooks. A good deal of bowel irritation is caused by half cooked or badly cooked rations.

AEROTHERAPY

CONICAL CORNEA AND HOT AIR CAUTERY

Karl Grossmann, *British Medical Journal*, August 26, 1905.

Grossman finds that the application of cauterization to the conical cornea is more satisfactorily effected by the use of dry hot air than by the red hot iron or galvano-cautery, as the latter completely destroy the tissues which they touch and it is hardly possible to regulate the temperature in any but a very inaccurate way. Sometimes it is not desirable to carry the cauterization to the extent of actual necrosis of the tissue to any great depth, but only to slightly singe the surface, sometimes even no more than a drying up of the surface is desirable, and in this situation dry hot air cautery is particularly effective.

The apparatus consists of a coil of platinum tubing inside a Paquelin cautery. The air in the coil is heated by the Paquelin and the rubber tubing is so arranged that the same set of bulbs which supplies the Paquelin with the benzoline mixture sends an ordinary fresh-air current through the heated metal coil. The heated air as it comes out of the nozzle is rapidly cooled by contact with the atmosphere and thus an easy means of regulating the temperature is arrived at by varying the distance of the nozzle from the part to be treated. The hot air current can be started or arrested at any moment by the pressure of a finger on the supplying rubber tube.

The treatment was originally introduced for lupus, angiomata, etc., whereby Grossman was led to consider that it might be useful in some minor surgical troubles and he applied it to cases of infectious corneal ulceration with and without hypopyon, naevus of the lid, and conical cornea. He was led to consider the treatment particularly appropriate for the latter condition because of the various degrees of heat that can be applied. His technique is as follows: the cocainized cornea is placed in the desired position so that the apex of the conus becomes easily accessible to the instrument, and fixed in the usual manner. The stream of hot air is then directed on to the apex of the cone. The time period during which the application should be continued is not definitely stated, but the author says that "The degree of cauterization can best be estimated by previous experimenting with bullock's eyes."

When the hot air blast is applied to the cornea for the first time the organ will sometimes flatten, almost collapse and dry up. This is due to the fact that the hot air not only dries up the part cauterized, which becomes white, but that it also dries up the epithelium of the surrounding parts of the cornea, which becomes grayish. The parts, however, very soon resume their old form and color, unless cauterization has been carried too far. He recommends that

the cauterization be repeated three or four times for a short period of time, rather than to run any risk of precipitating the accident by long applications. Five cases of conical cornea which he has treated by this method have all exhibited marked improvement, as follows:

"*Case* 1. A. B., 23 years of age, female. Right eye: Vision, hand-movements. Vision after three applications 2/6 with -2.0.

"*Case* 2. B. T., 28, male. Right eye, hand-movements; vision 3/6 without glasses. Four applications.

"*Case* 3. W. M., 19, female. Right eye, hand-movements; SR. after four applications 3/6 with -3.0; four applications.

"*Case* 4. W. M., 19, female. Left eye 1/10 -10; SL. 5/6 -1.0 two applications.

"*Case* 5. J. T., 35, male. Left eye. finger in 3 yards-5/6 cyl-; SL. 4/6-2.5; four applications."

THE HOT AIR TREATMENT OF INFLAMED JOINTS

W. Ross Thomson, *N. Y. Med. Jour., & Phil. Med. Jour.,* September 9, 1905.

Thomson looks upon the application of dry hot air as one of the most efficient methods, if not the most efficient, of treating acutely inflamed joints. He states that "dry heat will just as promptly relieve pain and induce sleep as a dose of codeine. Dry heat, moreover, causes a profuse sweating, which certainly helps to rid the patient of deleterious matter in the blood." Recent cases respond most promptly to this method, and the longer a case has been treated by other methods the more difficult it is to effect a cure by the use of dry hot air. A case seen during the first three days of an attack of articular inflammation (variety not stated) will almost invariably be cured in three bakings; if it has been treated otherwise for six weeks it may require 15 or more dry hot air applications according to this author.

His usual technique is to apply the treatment for an hour as high as the patient can stand, giving him a full glass of water to sip slowly meanwhile during the treatment; this latter promotes free sweating. After the treatment the part is bathed in warm grain alcohol or spirits of camphor and carefully dried, but massage is rarely used. He recommends keeping the limb at absolute rest between the treatments. Twelve cases are reported, all of which "showed the typical signs of acute articular inflammation" (varieties not stated) in which a cure resulted with from two to nineteen treatments.

HYDROTHERAPY

A CASE OF CONGENITAL HYPERTROPHIC STENOSIS OF THE PYLORUS; TREATMENT BY GASTRIC LAVAGE WITH COMPLETE RECOVERY

A. J. Blaxland, *London Lancet,* September 16th, 1905.

Blaxland was led to use lavage in the following cases through an article by Dr. G. F. Still in the Lancet of March 11th, in which Dr. Still strongly advocated the use of stomach washing and perhaps nasal feeding in cases of this sort before operation. "The patient, a boy, aged four months, was admitted into the hospital on February 17, 1905, under the care of Dr. Garrod, for vomiting, wasting, and constipation. The child at birth, following a nine months' pregnancy and a normal labor, was in apparently perfect health and weighed ten pounds. He was not put to the breast

but was given diluted cow's milk, and went on quite well for a fortnight, at the end of which time he began to vomit and to lose weight. The vomiting occurred at moderately long intervals and was of a very forcible character. Large quantities, two or three feeds, were vomited at a time. A medical man was called in and various foods were tried, Nestle's milk, Horlick's malted milk, Mellin's food, and "humanized" milk, all without success, and he was taken to the hospital at the age of four months, his weight then being eight pounds. The child was the last of eight, two of whom died in infancy from meningitis, and the others were quite healthy and strong.

"On admission the little patient was found to be considerably wasted, the skin was shrunken, and the expression was anxious. The tongue was clean. The abdomen, a little shrunken in, showed well-marked peristalsis in the area of the stomach which could be brought out by flicking the abdominal wall. This peristalsis passed in slow waves from left to right and divided the stomach into two or three portions, each of about the size of a small Tangerine orange. On gentle but deep palpation a hard, elongated lump of about half the size of the terminal phalanx of the little finger could be felt midway between the umbilicus and the right costal margin. This lump, not always palpable, could often be felt to form under the finger and it was most distinct when the gastric peristalsis was most obvious. There was no doubt that the lump was a hypertrophied pylorus. The rest of the body was apparently normal, no malformations being found. The vomiting occurred about once a day for the first three or four days after admission and was very forcible, the stomach contents being "shot" out. The vomit was very large and markedly acid in reaction. The motions were small but otherwise natural.

"The effect of treatment, which consisted entirely in careful dieting and gastric lavage, was immediately and continuously successful. The feeding consisted at first (February 16th) entirely of "humanized" milk, three ounces being given every two hours, and this was increased on the 28th to three and a half ounces and on March 9th to four ounces. For the first four days one or two big vomits occurred daily, and on February 20th the stomach was washed out and this was continued twice daily. The immediate effect of this was that there was no vomiting at all for 11 days and after that only two vomits a week on an average. After April 1st the stomach was washed out only once a day and the vomiting increased, and so peptonized milk was given, four ounces with ten drops of cream, alternating with the "humanized" milk, and this had the desired effect of checking the vomiting. After May 20th the stomach was washed out but twice a week and the child was put back on "humanized" milk only. On June 20th three ounces of cow's milk with one ounce of barley water and ten drops of cream were substituted, the feeds being given every two hours, and on the 30th the child left the hospital apparently quite well.

"The effect of the treatment on the weight and general condition of the child was as marked as that on the frequency of the vomiting, and with the improvement the abnormal physical signs in the abdomen gradually disappeared. The pylorus became increasingly difficult to palpate, partly due to the increased thickness of the abdominal wall with fat, and it was not felt at all after April 20th. The peristalsis also became less marked and for the last fortnight before leaving the hospital was practically imperceptible."

The child was under treatment four months and one-half during which he gained 4½ pounds, and three months later he was still thriving and had gained another pound.

PSYCHOTHERAPY

PSYCHOLOGY OF THE SYMPTOMS OF RHYTHM IN MENTAL DISEASES

Fauser, *Centralblatt fur Nervenheilkunde,* August 15th.

After tracing the presence of rhythm in all grades of developmental life, seen first in pure motility phenomena as walking, climbing, etc., then in the varied activities of early racial life, through play into the more aesthetic forms of the dance, he traces these into the field of the abnormal. Here he views the stereotypie, the negativesmus, the katatonic movements as further exhibitions of this same fundamental phenomenon seen in early grades of the normal most plainly. In his study upon this he resolves the rhythm of these motility phenomena into an underlying rhythm, or at least fluctuation of the attention processes. When this varies from acuity to laxness the movements vary accordingly in their immediate adaptability to environment.

It is a step at reducing the more complex picture of the abnormal mind into the elements which are fundamental. As such the article is worth reading in its entirety.

STUDY OF FATIGUE CURVES IN NORMAL AND ABNORMAL MIND

Brenkuik, *Journal f. Psychologie u. Neur,* Bd. 4, 1904.

We are all accustomed to talk in a rather loose manner as to fatigue. It is a mighty handy factor to invoke in any condition when we are lost for sufficient causation trains to explain affairs. Usually in this we go blindly ahead, confident that fatigue is or ought to be the birthright of any American citizen. But we do not measure it, much less differentiate the particular manifestations seen in different conditions.

Author has here given a series of tracings taken under varied fatigue variations and carried out upon the normal and the abnormal. To describe these curves in language is impossible, but to study them in the chart presented by the writer may well be a source of considerable information and a possible deterrent from using terms until they are verified by exact methods.

METHODS OF MEASUREMENT OF MUSCLE AND MOVEMENT DISTURBANCE

Curshman *Centrabl. f. Nerwenheilkunde,* July 15, 1905.

This in its purpose of precision is similar to the foregoing. The muscle study is carried out with the aid of the faradic electrical current. The slightest current necessary to make that movement which strikes the threshold of consciousness, is taken as the standard and on this the comparative tests are based. In the abnormal cases, such as tabes, etc., this threshold is raised; i. e., the stimulus necessary to produce sensation must be greatly increased. For movement, the passive movement is adopted through a fixed and measureable arc. The degree of motion possible, before sensation of such movement strikes the threshold, is the index. These necessary minimal movements are so useful in early diagnosis that it is strange to see their neglect. The sensations of movement are very often the earliest affected in tabes, in paresis, and in several other conditions. The motor neurons seem to suffer far earlier than others. These tests reveal fine shades of departure from the normal which are essential. The paper is worth reading.

STUDY IN ABNORMAL PSYCHOLOGY

Parker, *Boston Medical and Surgical,* Aug. 31st and Sept. 7th.

Author here gives case and analysis of a subconscious formation. The beginning rested in a psychic trauma. The other initial marks were an amnesia with recurring attacks simulating *petit mal.* The development and increase of these attacks as they assumed more of the type of pure automatism with a larger destructiveness of the personality is followed. The analysis is found in the latter portion of the paper and is correlated with that which might be called the treatment. It is not the treatment of the suggestive therapeutist. It is based upon the synthesis of consciousness, in the recovery of the lost content and, in particular, the determination of that which is called the aura of the attacks. The relation of this aura to the series as the psycho-genetic point is important. It is the element associated with the upper level and with the sub-conscious content and is situated, in a time way, at the point and moment of break. Its double connection explains its function.

CLIMATOTHERAPY

TO WHAT EXTENT IS CLIMATE A NEGLIGIBLE FACTOR IN THE TREATMENT OF PULMONARY TUBERCULOSIS?

W. L. Dunn, *American Medicine,* August 26, 1905.

The author recognizes the fact that a certain contingent of the medical profession have come of recent years to disregard the claims of climatotherapy in the treatment of consumption and have ceased to resort to this method in the management of their cases. While asserting no specific property for any climate Dunn believes it is going entirely too far to deny, absolutely, the influence of climatic conditions over the course of the disease, and those who are so doing must, he believes, sooner or later recede from that extreme ground.

The author takes the position that the dietetic-hygenic regimen is the central point of treatment around which all other factors or methods must be grouped as adjuncts, or as influences which may favor its efficient conduct whether at home, in a climatic resort or elsewhere. The various elements which make up the complex known as climate, viz: soil, sunshine, rainfall and snow, humidity and temperature, winds, air, purity, and altitude are then considered seriatim, the impress of each factor on the clinical history being succinctly portrayed.

Perhaps the most valuable feature of the author's contribution is the very practical one so often ignored in papers of this kind, viz., that relating to the patient's financial status. In referring a patient to a climatic resort it is not enough that he can make and scrape together enough to enable him to live for a few weeks or months in some cheap or indifferent boarding-house. It is just as necessary that he live under the proper conditions and supervision as at home. Climate does not make insufficient and bad food nutritious, does not make small, ill-ventilated bedrooms healthful. No matter how bright the sun may be it will not penetrate to the depths of the air-shaft bed-room; nor do climatic conditions teach the patient how to care for himself from day to day. He must be able to pay for a sleeping-room of sufficient size, properly ventilated with the proper exposure, and in a location free from dust, smoke, and the odors of a

city. "It is to me most pathetic to see here in our own mountain resort (Asheville) so many who have sacrificed the earnings and savings of years to come here to live in a cheap boarding-house or hotel in the center of the city in foul-smelling, badly-ventilated rooms where the sun never reaches, but where noise, dust, smoke and evil odors find a ready access. Many times you will find that these very persons have left a nice little cottage home in a large yard or garden in the suburbs of a city, or even on a farm." The writer stoutly inveighs against sending any patient to a climatic resort who has not the means to live under conditions as good as, or better than those that could be obtained in his own home. He should also be financially able to remain away from home not six weeks or two months, but as long as the exigencies of his case may require.

The writer makes out a strong case for the value of climatic treatment in cases where it can be properly carried out. The essential element of the management being a strict attention to details with a neglect of nothing that might exert an influence for good over the course of the disease, it becomes absolutely incumbent upon the attending physician to give the patient the benefit of everything that may improve his chances of recovery, which even in the earliest stage are not so numerous that a single one may be safely neglected. There can be no possibility of a doubt, other things being equal, that where there is a maximum of sunshine and pure air, there the proper regimen can be most effectually carried out. He concludes that climate is a negligible factor only when the patient's financial status will not permit him to live in a resort under conditions as favorable as those attainable at home, or when the patient has not the moral stamina and the tenacity of purpose to make a serious business of getting well, or when the disease is hopelessly advanced.

Special Plates Illustrating

Bullet in Knee, Congenital Dislocation of Epiphyses of Femur, Cancerous Femur, and Radiostereograms of Hand After Mine Explosion.

32-calibre bullet in knee. Missile entered at the middle of the left thigh, about one inch to inner side of anterior line, and passed downward striking the bone at about the middle of the lower third, with enough force to almost embed itself out at such an angle as to glance over to the inner side of the joint bringing up in the internal tuberosity of the tibia. Enough lead was left where it struck the femur to leave a very dark spot and the raised periosteum can be observed for quite two inches along the bone.

After locating the bullet with the fluoroscope, a light bandage was passed around the limb and two hat-pins crossed with their intersection over the missile, to give the surgeon, Dr. Lindley, of Hamilton, Mo., a good idea of the topography of the parts as related to the location of the bullet. This roentgenograph shows how hard it is to find a bullet where you think it ought to be, and how easy for the X-Ray to find it where it is.

Roentgenographed 50 days after injury with a Birtman 24-plate static machine, Friedlander No. 7 tube fifteen inches from plate; three minutes exposure; Pyro developer.

By Dr. W. L. Brosius, Gallatin, Missouri.

Congenital Dislocation of the Epiphyses of the Femur in a Girl four years old.

Plate also shows the loaded sigmoid flexure, the gluteau folds, skin, subcutaneous adipose tissue, and muscular layers.

Made with a No. 7 Friedlander tube located fifteen inches from the plate, excited by a Birtman 24-plate static machine. Cramer plate, Pyro developer.

By Dr. William L. Brosius, Gallatin, Missouri.

Cancerous femur fractured in rising from a chair; Diagnosis verified at autopsy a month later. Patient also had cancer of breast.

Taken with 15-inch, specially-constructed Carstarphen coil (90 miles of No. 32 B. and S. gauge wire in the secondary, wound in pancake sections), Mercury jet interrupter, Muller 8-inch tube, 20 inches from plate, exposure 10 seconds. Cramer medium isochromatic plate.

By Dr. G. H. Stover, of Denver, Colorado.

Radiostereograms of hand after mine explosion. Loss of index finger and metacarpal; fracture of rest of metacarpals with palmar displacement of fragments. Pieces of dynamite cap embedded in tissues. To be viewed through an ordinary parlor stereoscope.

Skiagraphed with same apparatus and technique as preceding plate, exposure five seconds.

By Dr. G. H. Stover, of Denver, Colorado.

Figure I.

Illustrating the use of the cabinet in locating foreign bodies by the Caliper method.

Figure II.

Cabinet with screen removed and the frame carrying the Roentgenoscope inserted in the window.

Illustrating The Dangers of Roentgenoscopic Work — *Rankin.*
The Archives of Physiological Therapy — December, 1905

THE ARCHIVES OF PHYSIOLOGICAL THERAPY

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REMARKS ON THE DANGERS OF ROENTGENOSCOPIC WORK; SOME PLANS FOR MINIMIZING THEM.

BY JOHN T. RANKIN, M.D., LOS ANGELES, CALIFORNIA

THE physician who is constantly doing roentgenoscopic work is in special danger of ultimate personal injury from the deleterious action of the focus tube rays; and the man who only occasionally, four or five times per month, uses the roentgenoscope should not consider himself free from the dangers incident to such work. But let all who have to do with this peculiar force remember that its action is cumulative, and that while one year's work within its insidious influence may not show any evil effects, the second year may bring forth most deplorable consequences from which the worker may never recover.

Those physicians and investigators who have suffered from Roentgen ray injuries may be divided into two classes. In the first is the innocent victim who began experimenting with the strange emanation from the Crookes tube early in the history of the phenomena, at a time when all were ignorant of the action of the rays. In the second class is the careless victim who, although he has heard reports of injury to Roentgen ray workers, and perhaps has seen some of the evil effects thereof, still continues to carelessly expose his person to the radiations.

One would think that the members of the second class would be at the present time few in number, but on the contrary the membership is quite large, and we have seen men from this class whose carelessness has resulted in irreparable injury to themselves. This carelessness in some, is due to a feeling of immunity to injury from such innocent appearing factors; a lack of appreciation of the potency of the rays. Others allow their

enthusiasm to get the best of their judgment and instinct of self-preservation.

We should like to look into the future and see what the second and third decades of Roentgen radiance will bring forth, with a special query as to its ultimate effect on those who, during this period, have been, but mildly, within its sphere of action. Many times the question comes to us who are working with this subtle force, as to the probable result it will have upon our health in years to come. We try to make ourselves believe that we are amply protected and that but a small proportion of the rays are afforded access to our bodies. It would seem that many physicians are in imminent danger on account of a false sense of security, which is afforded by the use of insufficient protection. Many have been told that they would be in the neutral zone if they would stand back of the target; others have read and believe that they will be safe if they keep six or seven feet away from the active tube. Many are informed that when using the roentgenoscope they can protect their faces and eyes by placing a thin plate of common glass over the fluorescent surface.

Much interest is taken in the question of protection to the Roentgen ray worker, and by the use of tube shields, non-radiable tube boxes, ray-proof clothing, and other such devices, the operator may be practically secure from injury during roentgenographic and therapeutic work. But roentgenoscopic examinations have been especially dangerous because of the difficulty of utilizing this method, without some measure of exposure to the examiner. For our roentgenoscopic work we have had made what we term a roentgenoscopic cabinet, which is a folding dark box, similar to the Mackenzie-Davidson "Sentry Tent." This cabinet has been used by the writer for the past year and a half. From its simplicity we feel certain that some such arrangement must be in use by many workers, but as we have seen no description of such apparatus, we take the liberty of presenting our ideas concerning the value of the cabinet to the Roentgen ray worker.

The box which we have been using is a modest domestic creation, but we believe that some such device with numerous important modifications will be a necessary future equipment of the physician doing Roentgen ray work. The cabinet was built in particular to serve the following purposes: It offers to the examiner as complete protection from the rays as it is possible to secure. It is light-proof and so greatly increases the retinal sensitiveness of the observer. It makes it possible for several physicians to make an examination at the same time, thus reducing the time of exposure to a minimum, and it is frequently of advantage to have several simultaneous witnesses in demonstrating a particular point. It leaves the patient in a light room and thus diminishes the nervousness and fear of injury, which is so often caused by the lurid phenomena which occur when the examination is conducted in a dark room. When an advantageous position or view is secured a plate may be quickly inserted in front of the screen and a graphic reproduction secured. The worker may thus watch the process during exposure, and by experience may learn to time the exposure by the shadow effect on the screen. If the intensifying effect of the screen is desired a plate may be slipped between the fluorescent surface of the screen and the protective lead glass. We believe that some day the time of exposure may be quite accurately timed by photochemic effects produced by the rays, similar to the Holzknecht method of dose measurement in therapeutic work.

The cabinet which we have been using is folding and portable. When not in use, it is taken apart and occupies but a small space in the office. It may be quickly assembled and when set up makes a box 3 feet wide, 4 feet long, and 6 feet

high. The skeleton is of light wood, covered on sides and back with canvas, coated with white lead. The top is a detachable canvas covered frame. The front consists of ½ inch wood, heavily coated with white lead, and lined on the inside with sheet lead 1/32 of an inch in thickness. The door is arranged at the rear. The observing window may be of such size and height from the floor as will best suit the examiner, or several windows, with detachable lead doors, may be placed at different heights. For general purposes, however, it will answer to cut the window so that the lower border will be 3 feet 6 inches or 4 feet from the floor. In size it should be large enough to receive a 14x16 inch screen, and should set out from the cabinet about 3 or 4 inches, so that the part under examination may be easily placed against the screen. Lead frames having different sized openings should be made to slide in front of the screen so that the observation opening may be made of any desired size from 14x16 down to a few square inches. Lead frames having various shaped openings may be used for special examinations, as for instance, when it is desired to confine the rays to particular areas. Oftentimes, in examining the leg or arm on a large screen there will be such a diffusion of the rays as to cause a blurring or indistinct outline of the image. We find that this is overcome, in a measure, by placing in front of the screen a lead frame with an opening the size and shape of which is adapted to that portion of the body under examination. This enables the examiner to localize, as it were, his observations to a specified point; and also serves as a protective feature, as the rays, which would otherwise pass to the screen, around the examined part, are largely cut off and those rays which do reach the screen must first pass through the examined area. One screen, large enough to fit into the window at its greatest dimensions, is thus sufficient. We simply diminish its size and vary its shape by inserting in front of it a lead frame having an opening of such size and shape as we desire for the case at hand.

Many times the examination may be better made by using the ordinary roentgenoscope, such as in investigations around the neck, in the axillae and other places where the screen could not be properly placed; also in cases where it is necessary to have a certain range of motion the roentgenoscope is needed. The arrangement for its use is as follows: A lead-lined frame is made to fit into the 14x16 window. In this frame is a central opening 11 inches square. Around the edge of this opening a ray proof cloth is fastened, the other end of the cloth being tightly secured around the "scope," beyond the handle. The cloth must be of size sufficient to allow plenty of movement of the "scope" in all directions. By sewing a doubled piece of black canton flannel around the edge of the opening in the cloth, through which the roentgenoscope passes, and inserting a heavy rubber band between the layers of the canton flannel, this will tighten down around the "scope" so that no light can enter. This plan allows ready removal of the roentgenoscope, and the use of different sized "scopes" in the same frame is thus made possible.

The ortho-roentgenographic apparatus may be used with the cabinet by having a ray-proof cloth hood extending from a frame inserted in the cabinet window and fastening around the edge of the ortho-roentgenographic screen. At each side of the observation window an arm hole is cut. Around the edges of these holes non-radiable sleeves are attached, and ray-proof gloves fastened to the free extremities of the sleeves. This affords opportunity for the examiner to change the position of the patient or part under examination, to locate foreign bodies and to direct the manipulations of the surgeon in the reduction of fractures and

dislocations under the rays. An arm hole arranged as above may be placed at the side of the cabinet to give access to A small window, protected by heavy lead glass, may be placed at a convenient point for occasional outside observation. When not in use, all of these anterior openings should be closed with lead doors. Above the window is a metal rod carrying cloth straps to support the arm or leg before the screen. Both the roentgenoscope and screen should have a plate of heavy lead glass over the fluorescent surface and a film of transparent celluloid over the outer surface to protect it from the moisture of the area under examination. If desirable, one may swing a mirror on hinges from the inner side wall of the cabinet, placing it at such an angle that the shadow on the screen is reflected in the mirror, so that the examination may be conducted indirectly.

This mirror method has been advocated by many roentgenologists, and probably affords the most complete protection. Any convenient plan used for ventilating dark rooms may be made applicable to the cabinet.

EDITORIAL

WE regret profoundly that conditions are still such as to compel us to explain that the delay in issuing the present number of THE ARCHIVES is due to a printers' strike. Also that this factor, together with delay on the part of one of the stenographers in getting his report to us, has rendered it impossible to publish any of the proceedings of the September conventions of the American Electro-Therapeutic Association or the American Roentgen Ray Society in earlier issues. Believing that it is the desire of our readers to receive these reports as soon as possible we have, therefore, devoted a large part of the present issue to these proceedings, running sixteen extra pages for this purpose, and the remainder will follow in the January number.

The circulation of THE ARCHIVES has now attained a size which prohibits sewing the forms together any longer; they will therefore be machine-wired in the future.

JOURNAL OF ADVANCED THERAPEUTICS

New York, N. Y., October, 1905

1. Progress of Electro-Therapeutics and Allied Methods — Emil Heuel.
2. Radioactive Water and Other Fluids and Their Preparation—Wm. James Morton.
3. Causes and Cure of Cancer and Some of the Causes of Failure in Treating Malignant Growths by the X-ray and Electric Currents — Robert Reyburn.
4. Pelvic Inflammations of the Female Pelvis Unaccompanied by Pus — A. W. Baer.
5. The Physics of High Frequency Currents with Special Reference to Their Use in Therapeutics — Earle L. Ovington.

2. See THE ARCHIVES, page 343.
3. See THE ARCHIVES, page 336.
4. See THE ARCHIVES, page 335.

5. This series of articles, ending with this present number, has dealt very briefly with the physics of high frequency discharges in general, including the methods especially suggested by D'Arsonval, Oudin, and Tesla. It treats very much at length of the many and valuable features of the author's special apparatus for generating and applying for therapeutic purposes, the various well-known forms of electrical energy, and also of some other forms not so well known and suggested by himself.

The physics, of course, is not intended to be complete or exhaustive, and is really confined to a few diagrams, clearly drawn and well explained in non-technical language. No formulas are given, and the quantitative relations involved are entirely omitted from the discussion. An ingenious water analogue is suggested for making clear the oscillatory character of the discharge between the terminals of a step-up transformer of any kind, and further also to explain how a part of the energy can be utilized in the usual condenser shunt circuit.

At about the middle of the fifth page (there are 30 in all) the "Ovington Electro-Therapeutic and High Frequency Apparatus" is introduced and thereafter attention is directed to its many and great advantages in all kinds of electro-therapeutic practice. It possesses several novel features invented by the author, and while the "physics" of the various circuits seems for the time to have been overlooked, the universal adaptability and obvious superiority of this special arrangement of parts is dwelt upon in a very convincing manner.

Attention is called to the greater efficiency of American high frequency apparatus in general over that of foreign make, in that in the former a high potential transformer having a closed magnetic circuit is employed instead of a static machine or an induction coil of the usual form.

The practical independence of the length of the spark gap and the frequency is explained, though the real reason for this non-relation is rather implied than specifically stated. The formula stating the relation of frequency to inductance, capacity, and resistance might have made this point clearer.

The subject of "resonance" is not made at all clear as applied to this subject. It is not explained at all as to just what circuits should be in tune, and nothing is said on the subject when applied to the author's machine, except that he accomplishes "this result in the machine before you by means of the switch marked 'Frequency Changing Switch (Fig. 3).'

Much space is given to explaining the various external attachments of the author's apparatus, and a number of very interesting experiments from the point of view of pure science are de-

scribed. Special reference is made to Maxwell's "displacement currents," and the important part the author believes they play in the subject of electro-therapeutics.

ARCHIVES OF THE ROENTGEN RAY

London, England, October, 1905.

1. Notes on Fluorescence — Henry G. Piffard.
2. The Measurement of the Efficiency of the Induction Coil — J. K. A. Wertheim-Salomonson.
3. The True Principles of X-ray Interpretation — William Cotton.
4. The Physiology of the Chest in Exercise — E. M. Corner.
5. A Report on the General Utility of the High Frequency Currents — H. E. Gamlin.
6. Notes on Tropical Climatology — R. W. Felkin.

1. The phenomenon of fluorescence in solid bodies and solutions when exposed to the stimulation of the higher frequencies of the spectrum was known 50 years ago, but was esteemed of little importance for 20 years when Becquerel discovered that photographic plates, treated with a solution of chlorophyl, were sensitive to the longer wave length, and would respond to green, yellow, and red.

Later Vogel was able to render bromide of silver gelatine plates sensitive by treating them with solutions of eosin. Following this Piffard proved that ordinary gelatine bromide plates became sensitive to blue, green, and yellow if treated by dilute solutions of uranium nitrate, quinine, or æsculin, all these solutions being fluorescent. These facts published by him 16 years ago were rediscovered last year in France.

Finsen's discoveries again awakened Piffard's interest in this matter and he made a large number of experiments. His higher frequencies were obtained by means of a condenser spark lamp, or his own hand arc lamp with iron terminals. Specimens of minerals including 50 specimens of Willemite were examined, and he details the results in 34 examinations. Many of these minerals phosphoresce for an indefinite period following exposure to ultra-violet and X-radiations, and if they be laid in contact with the sensitive surface of a photographic plate for a few moments in a dark room will deeply affect the plate. Spectra of the various minerals during fluorescence were photographed by means of a small pocket spectroscope and the resulting spectra are reproduced.

Many substances that do not fluoresce in a solid state become fluorescent when dissolved in water. Quinine, æsculin, and fluorescine fluoresce brilliantly in solution when subjected to ultra-violet rays, *but not when exposed to X-rays or radium.*

In medicine fluorescence has been employed by Tappenier who applied solutions of eosin (5%) to ulcerating surfaces, and then exposed to direct sunlight or strong electric light. Kemp introduces solutions of quinine or fluorescine into the stomach in quantities sufficient to distend it. He then introduces a small incandescent lamp, and the resulting fluorescence is visible in a dark room, enabling him to outline the stomach. Morton introduces fluorescent solutions into the stomach, using quinine or fluorescine. These solutions are absorbed into the blood and carried to all parts of the body. X-rays are then employed, and the resulting fluorescence is supposed to increase the action of the rays. Picard says that no direct evidence of such fluorescence has yet been afforded, and he finds that he is unable to detect any fluorescence of these solutions under either X-rays or radium. He believes that Morton's claims in this direction need to be investigated.

Much work needs to be done before fluorescence can be utilized in clinical medicine.

2. The efficiency of the coil is as the ratio of the electrical energy absorbed by the primary to the available energy at the secondary terminals, hence accurate measurement of the energy in both circuits is necessary. The efficiency of the coil varies under different conditions, and can be calculated only for a definite primary energy and a definite secondary resistance. The energy applied by the primary may be measured by a wattmeter of great precision, and the energy acting in the primary is equal to the total energy minus the energy absorbed in the rheostat and interrupter. With an electrolytic break the energy transformed into heat, and chemical change may be estimated by a wattmeter, and varies from 30 to 38 per cent. of total energy. The author's measurement usually reads from 61 to 67 per cent., and he estimates that in ordinary use from 63 to 50 per cent. of the total energy is absorbed in the Wehnelt.

The secondary discharge may be estimated by means of a calorimeter. He uses for this purpose a glass vessel filled with liquid paraffin, specific gravity 0.85%. A thin rod of slate is immersed in the paraffin, and the secondary discharge passed through the rod which becomes heated and the heat is absorbed by the paraffin. The liquid is kept in motion and the temperature read every 30 seconds to the 100th of a degree. Previous tests having determined the number of watt-seconds causing a rise of one degree and the proper correction for loss of heat made, the final measurements could be depended on to within one-half per cent. A slate rod 20 centimeters long with a sectional area of 20 square millimeters, was employed. Such a rod has a resistance about equal to that of a tube which will back up an equivalent gap of 11 centimeters.

His experiments showed an efficiency of 30 to 33 per cent. remaining, 60 to 70 per cent. of energy being absorbed by the primary, the core, and the Wehnelt. With a mechanical interruptor, however, from 55 to 58 per cent. of the primary energy was transformed and available at the secondary terminals. He is unable as yet to give a value for the efficiency of the series of transformation from electrical energy to the Roentgen ray.

The energy of the ray, however, may be estimated by the amount of chemical action on a dry plate as compared with a standard candle. He has demonstrated that for every one hundred watts passed through the coil, there is obtained Roentgen radiation equal to 0.426 of a candle power unit.

3. In study of X-ray negatives the observer's eye should be stationed in the position held by the anti-cathode during the exposure. If the film side is held toward the observer in this position, the negative will appear as would the objects, were they transparent and viewed at the same distance from the observer's eye. The X-ray print and the fluorescent examination, unless viewed in a mirror or rendered transparent and viewed through the back, ought to be discarded in favor of the negative, since the print is a reversed image.

4. Corner considers that too much attention is given to the education of the mind and too little to the education of the body, particularly the chest. Even in those who are otherwise well developed poorly developed chests will frequently be found. Particular attention should be paid to the development during the period of growth. Persons with deficient chest expansion are never fit for great protracted efforts, since the deficient aspiration of the venous blood into the chest prevents its rapid purification. The chest should be the chief portion of the body to be steadily developed. Respiratory exercise should be taught the young, but in the weak frequent

rests should be interposed during exercise, and with any marked increase of the number of pulse beats the lesson should cease or be interrupted by rests.

5. Gamlen finds high-frequency currents to be an excellent tonic, painless and easy of administration, and the patient gains benefit from the start. In the treatment by auto-condensation his patients recline on a lounge and the currents are passed to handles which the patients grasp. The sitting lasts 20 minutes and the effect is evident in a few minutes. The pulse becomes slow and full. Sometimes the patient breaks out in perspiration and there may be a rise in temperature. The seance is followed by a sleepy, drowsy feeling, and should be followed by a brief rest and some light nourishment. Patients usually improve as shown by increased appetite, sleep, weight, cheerfulness, and vitality.

He has treated practically, everything with varying success, from consumption to venereal diseases. He combines the use of high-frequency currents with X-ray in the treatment of skin diseases. The results of the treatment of lupus, by high-frequency currents, he has found unsatisfactory, since those which are apparently cured have relapsed, and the improvement shown in other cases was only temporary. In chronic ulcers improvement always followed local applications of high frequency.

In a case of granular pharyngitis the patient who had lost her voice for several months, being under constant medical treatment with no result, was placed on treatment with a vacuum tube electrode, which application caused a congestion which persisted for several days, but at the end of 30 sittings, the granulations had disappeared, the mucous membrane was healthy, and the enlarged tonsils normal. Another similar case was cured by fourteen applications.

The writer feels that these currents are of considerable value in the treatment of consumption, and should be employed where sanitarium treatment cannot be obtained.

6. Felkin claims that the Japanese and Chinese knew that the mosquito conveyed malaria hundreds of years ago, and the writer foretold this as long ago as 1882, but it is necessary to turn to a study of climate for further advance in knowledge of the real causes of disease. Thus plague, for example, may occur at any altitude, yet it requires for epidemic character a temperature between 60° and 85° F. The chief characteristics of a tropical climate are the mean annual temperature of 84°, with an annual variation of 64°, a maxium of 118° and a minimum of 54°, with a fairly constant diurnal temperature. The constant almost daily rain at the equator sometimes modifies the temperature. The mean annual rain fall is about 55 inches, with two rainy seasons, one lasting from three to four months and the other from six weeks to two months. Heat and moisture, therefore, are the two principal factors, yet cold, when it occurs, is felt severely. Thunder storms are frequent, vegetation shows rapid growth and decay, marshes are quickly formed and as rapidly dried up, and insect life is abundant. The natives are apathetic and lazy, with unbalanced, nervous system, less active digestion and more active skin and liver.

The effect of tropical climate on Europeans is marked, and the writer does not believe that they become truly acclimated, though they may partially adapt themselves for a time to the climate.

Children may be reared there, under favorable circumstances, but do not thrive, and families soon die out. The normal temperature of Europeans in the tropics is one-half a degree higher than at home. Exercise increases the temperature quickly, and it remains elevated for a long time.

Respiration is less frequent and the lungs give off less watery vapor. The pulse rate is slightly lowered, the urine diminished, perspiration increased, the nervous system enfeebled, insomnia prevalent, digestion slow, appetite capricious, loss of weight and muscle strength is noted.

Women attain puberty a year or two earlier, and miscarriages are more frequent than at home.

Woodruff has called attention to the harmful effects of the excessive light of the tropics, and the clothing therefore should be opaque and of a color to reflect as much heat as possible. The outer clothing white, gray or yellow, and under clothing black. The direct rays of the sun should be avoided, and houses painted not white but green, yellow or brown. Brunettes suffer less than blondes. The results of tropical residence may be nervous exhaustion, anæmia with or without cardiac complications, enlarged liver and spleen, congestion, cirrhosis, neuralgia or abscess of the liver, chronic diarrhœa, ague, dysentery, etc.

ARCHIVES D'ELECTRICITE MEDICALE

Bordeaux, France, September 10, 1905

1. Radiodiagnosis — Dr. Leon Hauchamps.
2. Electrotherapy in Industrial Accidents — Dr. Charles Renault.
3. Case of Ichthyosis Cured by Radiotherapy — Dr. Stephane Leduc.
4. New Interrupters for Coils — Dr. Armagnat.

1. The X-ray alone does not determine a diagnosis but it brings a good element of assistance to it.

For radioscopy a static machine should be preferred as giving a steadier image. For radiography, an induction coil is better as giving a greater intensity and therefore shortening the time of exposure.

Only tubes which can be regulated should be used; the osmo-regulator answers best for regulating purposes. The tube must be movable in all directions, a diaphragm placed before it must follow it in all its displacements. The center of the diaphragm must be on the normal incident ray of the tube. To determine the normal incidence, two metallic crossbars should be projected on the screen so as to have their intersections superposed. By using a small diaphragm we lessen the number of X-rays and eliminate all parasitic rays; the screen is then less brilliantly lighted, but the image is better outlined and the contrast between the different intensities of shade becomes more apparent.

Operator and patient must be in an absolutely dark room: as the luminosity of the tube itself is an inconvenience for the examination, everything must be hidden behind opaque curtains. To examine patients lying on their backs, they are placed on a black cloth stretched on a wooden frame as high as an ordinary table. The tube is placed under the stretcher. The screen is held above the patient. Practically the wrapping of the plate in black paper is sufficient, a special frame for the plates is superfluous.

The acuteness of vision is 50 to 100 times greater after ten minutes exposition in darkness, 200 times after 20 minutes. Stereoscopic radiography is not as advantageous as might be thought on account of the wide differences in interpretation by different observers.

The first medical application of X-rays was made in the examination of the skeleton. Since they have been used, fractures that have passed unnoticed are less frequent. Radiodiagnosis is capital in traumatic lesions of the ankle. It does not require any displacement of the limb, and is not hindered by oedema as is palpation, and it can be performed without removing the first emergency dressing. X-ray examination allows us to watch consolidation and the results of treatment even through the thickest splints.

We can also give more precision to prognosis, either immediate or remote. In medico-legal cases, radiography enables us to detect exaggeration or simulation on the patient's part. But the X-ray increases the responsibility of physicians, as the patient may get a radiograph and criticise the result. All the more as physicians and patients do not appreciate the same elements, the physician aiming chiefly at a good functional result, and the patient giving to deformity more value than it ought sometimes to have.

Roentgen rays are very useful in the diagnosis of bone lesions, periostitis, osteomyelitis, osteosarcoma, syphilitic osteitis, tubercular osteitis, actinomycosis, osteomalacia, cysts of bones. In rhachitis, X-ray examination is only confirmative of the clinical symptoms. In affections of joints, it adds precision to the symptoms, as in cases of incipient tubercular arthritis, deformity of articular surfaces, tophi, etc.

It is the best diagnostic element in lesions of the hip joint, and enables us to differentiate congenital dislocation from coxa vara and osteitis. Is also useful in the study of abnormalities, syndactylism or polydactylism. Determines the dates of ossification in bones. With a compression diaphragm such as is advocated by Albers-Schönberg for the detection of calculi, we can obtain a radiograph of any part of the pelvis or hip-joint, even in adipose patients when a radiograph of the whole pelvis is a physical impossibility. The same process may even demonstrate the structure of the sacrum and vertebræ.

In order to determine the exact location of an osteitis with fistulæ, lesions which do not always come out very plainly on the plate, Hauchamps uses the following process: Before taking the radiograph he pushes into every fistula a soft urethral catheter which follows all the sinuosities, and leaves it in place. He has been able thus to differentiate a vertebral from a femoral osteitis in two cases in both of which the fistulous opening was located at the upper and inner part of the thigh. In one case, the catheter went as high up as the third lumbar; in the other, it wound around the femur and stopped at the greater trochanter.

Darker and lighter shades on radiographic plates correspond to tissues either superposed or different histologically. A hard tumor not yet giving external deformity and difficult to explore by deep palpation will be delineated by X-rays. For instance, a partly-organized hæmatoma in the arm may be demonstrated by comparison with a plate showing the normal condition in the same region.

Foreign bodies may come from the outside or be produced in the organism. The exact location is the most important point in the diagnosis of foreign bodies of external origin. When the structures are not too thick two plates taken in two perpendicular planes are enough in most cases. The main point is to mark the normal incidence of the ray in each case by cross wires. But radioscopy is better and is sufficient except if the projectile is in the hand or inside the skull. He generally uses Warluzet and Polant's process, in which two diagonals passing through the foreign body are determined by displacing the tube. The intersection of both diagonals shows the exact location. The method is particularly convenient in the research for projectiles in the thorax or abdomen. Stereoscopic radiography is theoretically the best method, but it is practically very difficult to use.

Calculi cannot generally be detected by radioscopy. For radiographic examinations, too penetrating rays must be avoided, a diaphragm is necessary, and cylinder which compresses the soft structures and consequently shortens the distance between the tube and the calculus.

According to Albers-Schönberg a radiograph is good from the standpoint of calculus detection when it shows the last ribs, the traverse processes of the lumbar vertebræ, and even the structure of the latter and the edges of the psoas muscle. When such a radiograph does not show any abnormal shade, it eliminates calculi, at least calculi larger than a pea; small stones may escape detection.

Oxalic acid calculi are dense and easiest to detect; phosphatic and especially uric acid stones are lighter and more difficult to find. A good practice is to take two plates at an interval of a week, so as not to be misled by other spots that can be produced by many things, handling of the plate or intestinal contents for instance.

A partially-organized articular effusion can be detected by X-rays. Examination of the brain is difficult; the brain is contained in a completely closed cavity. All its parts have almost exactly the same density, consequently the same permeability to X-rays.

Metallic bodies are easy enough to localize. The examination for bodies near the eye must always be made by radioscopy: voluntary movements of the eyeball show whether the shadow follows the displacement of the eye or not.

We can outline extensive foci of osteitis; we can demonstrate the hypertrophy of the sella turcica in acromegaly. In the face, X-rays show the shape of the different sinuses especially the frontal which is so hard to examine. In dentistry, special difficulties arise from the fact that the image of both halves of the jaw are superposed. Darmegin has used films placed inside the dental arch. This technique is the best, but only one or two teeth can be properly focussed at a time. Necrosis, deformities, dental inclusion are made evident by X-rays. So are the number, the direction and the shape of roots. In cases of pyorrhœa alveolaris we can investigate the depth of pouches by introducing lead probes between the gums and teeth. We can follow the evolution of permanent teeth so as to extract the corresponding temporary teeth at the proper time. Lateral radioscopy of the neck will show us the spine, the pharynx, the æsophagus, the larynx, and the trachea as they would be seen on a vertical section. In a frontal radioscopy the trachea alone remains clear, the other organs being masked by the shadow of the spine.

The thorax is best examined by radioscopy. Physicians must be familiar with the different normal aspects according to age, sex, stoutness, muscular development. Beclere has defined the typical positions for radioscopic examinations of the thorax.

(*a*) Anterior, patient facing the screen.

(*b*) Posterior, patient turning his back to the screen.

In the two above-mentioned examinations the thoracic image is divided into three vertical zones, a median dark between two light surfaces; pulmonary fields. The median shade corresponds to the spine, heart, and great blood-vessels.

(*c*) Oblique right. Patient is obliquely traversed by the rays from behind forward and from left to right. The median shadows are thus dissociated, and the dissociation can be demonstrated by having the patient revolve slowly around his vertical axis. The spinal and the cardio-aortic shadows recede from one another and between appears a light zone termed the intermediate light space or posterior mediastinal space.

(*d*) Oblique posterior left. Patient is obliquely traversed from before backward and from right to left.

(*e*) Lateral. Patient is traversed from armpit to armpit. The cardiac shadow appears between two clear spaces retro-sternal and retro-cardiac.

Those positions must be used in succession; it will be well to modify the intensity and the penetrating power. We

can then see deviations of the spine and deformities of the thoracic cage. The pulmonary fields must be examined during inspiration and expiration; the outlines on both sides must be compared. Then examine the apex, after modifying the quality of the rays, so as to detect the slightest shadows suggestive of pulmonary condensation. The pulmonary hilum is best studied in the oblique positions. The heart may be measured by radioscopy with an orthodiagraph. In hospitals, we can do without such an apparatus. The screen is covered with thin, transparent paper. The tube, before which is placed a metallic cross-bar indicating normal incidence, is moved successively, so as to make the shade of the cross-bar follow the outline of the cardiac shadow on the screen. In uniting by a continuous line the points thus obtained, we have the actual size of the heart. The aorta must be examined separately.

The œsophagus occupies the intermediate clear space in the oblique posterior left position. It can be demonstrated by the introduction of soft rubber catheters containing mercury or lead, or of metallic sounds. Holzknecht gives bismuth powders or a milk of bismuth to swallow and studies the shadow of the canal during deglutition.

Methodical radioscopy will show hydro-pyo-pneumo-thorax, and all kinds of liquid effusions. Beclere has published the special technique he used once to diagnose an interlobar effusion.

Intrathoracic fistulæ are determined with the aid of fine catheters filled with mercury.

Generalized or localized emphysema and cavities increase the size or the illumination of the pulmonary fields. Other conditions reduce the same, such as pulmonary sclerosis or consolidation; pneumonia, hemorrhagic infractions, pulmonary gangrene will give more or less localized and irregular shadows. New growths, hydatid cysts, bronchial adenopathies, tubercular lesions are more difficult to detect, but sometimes show very clearly.

And lastly, from the displacement of surrounding shadows, and by induction we may diagnose unilateral pulmonary sclerosis, congestion and oedema, unilateral bronchial stenosis, bronchiectasis.

Pulmonary tuberculosis will in a few cases be detected by radioscopy before clinical symptoms appear; but in many cases percussion and auscultation are positive earlier than the screen.

All cardiac hypertrophies and displacements may be studied on the screen, but such a study lacks precision.

Radioscopy of the heart is most valuable when this organ is more or less distant from the anterior thoracic wall, and consequently less accessible to percussion. Percussion generally gives smaller dimensions than a radioscopic measurement taken as above stated.

Acquired dextrocardia will always be easily diagnosed from congenital; in the latter the inversion of the arch of the aorta always corresponds to the cardiac inversion.

Radiodiagnosis is most important in displacements and aneurisms of the aorta.

X-ray examination of the esophagus shows the exact location of strictures and enables us to diagnose real organic strictures from spasm. Finds also diverticulæ.

Radiographs of the thorax are not very interesting because they show only one position, while radioscopy shows a great number.

The abdomen is difficult to explore with X-ray. As for the liver, the superior border following the diaphragm is the only visible part. An enlargement of the liver corresponds to a higher level of the diaphragm. If the stomach be distended by gases, the left part of the diaphragm appears as a thin arciform movable slip with the gastric wall close to it. Artificial gaseous distension of the stomach is a great help. Roux, Wille-

main, have studied the motor function of the stomach.

The small intestine eludes X-ray investigations so far. The large intestine may be distended like the stomach. Some parts may be filled as the rectum or the sigmoid flexure. A milk of bismuth may be used.

X-rays are not used in kidney examination except for stones. In obstetrics, technical conditions are unfavorable. Bones are enormous, the foetus is far from the plate, soft structures are thick. Albers-Schönberg with his compression cylinder has been able, however, to find the head of the foetus in radiographs. X-rays are only useful in the diagnosis of pelvic conditions, and even then the utility is doubtful, because in most cases a good general radiograph of the pelvis cannot be obtained.

2. The physician's aim in treating industrial accidents is to get useful and practical results quickly. Electrotherapy has an enormous value in the treatment of many of those injuries. Dr. Renault reviews the question and groups the application of electricity under three headings.

(*a*) Direct electrical procedures.
(*b*) Indirect electrical procedures.
(*c*) X-rays and electro-diagnosis.

The direct electrical processes are, galvanic, faradic, high frequency, sinusoidal currents; bath, static, galvanocauteries.

The galvanic current may be used alone or combined with a faradic current, in muscular atrophy of traumatic origin, after contusions, dislocations, fractures, in traumatic neuritis or in symptomatic neuralgias, it may be useful. In such cases, we must treat the nerve by galvanization and the muscle by faradization or rhythmic galvano-faradization. For direct galvanization of the nerve Renault places the positive indifferent electrode between the shoulders, and connects the negative with a bath in which the limb affected by neuritis is immersed. After a few sittings, the pain is rapidly relieved. The writer has found this treatment very effective in periarthritis of the shoulder. He does not exceed 10 or 15 milliamperes during 15 or 20 minutes every day, and considers this point as very important, because of the necessity of keeping the skin in good condition if we want to give a treatment every day.

Continuous currents improve most cases of traumatic arthritis after contusions, dislocations or fractures, of hydarthrosis, of articular stiffness, of ankylosis, and of synovitis. The above-described method is generally available. If dealing with the shoulder or the hip-joint, large cotton, wool or felt electrodes are used instead of a bath. Of course the active electrode is connected with the negative pole. In cases of anchylosis or stiffness, the negative electrode should be moistened with a solution of sodium chloride.

Often in cooks and butchers a finger cut gets infected, and osteitis follows with a fistula. Renault has cured some of these fistulas by electrolysis. He puts a copper rod into the fistula and connects it with the positive pole. The negative indifferent electrode is placed on the nape of the neck, and the current is progressively increased as high as possible. Pain generally does not permit of a stronger current than 6 or 8 ma., when the copper rod is found adherent in the fistula and the latter has a characteristic greenish color. After 6 or 8 minutes, the index of the galvanometer is brought back to zero and the current is reversed up to 2 or 3 ma. The rod, now connected with the negative pole, soon loosens. After 6 or 10 sittings (one or two a week), the sinus was cured in most cases, when the bone was not totally necrotic.

Faradic currents are produced by induction coils. Galvano-faradic currents (De Watteville's currents) are ob-

tained by the introduction of a secondary coil in a galvanic circuit; such an introduction is made easier by the use of a commutator such as De Watteville's. In order to avoid muscular fatigue, these two currents are used in a rhythmical state; the best appliance is Bergonie's.

Muscular atrophy after contusions, fractures, dislocations, arthritis, is the principal indication for galvano-faradization. Satisfactory results are obtained in the course of time, extending from two weeks to three months. Traumatic anesthesia is best treated by a faradic brush connected with the negative pole of an induction coil having a fine wire.

Sinusoidal currents have a physical advantage; the increase and the decrease of intensity is progressive instead of being sudden as in faradic currents. But they require an elaborate installation. They may prove efficient in cases of neuritis after galvano-faradization has failed.

High-frequency currents deserve the same appreciation as sinusoidal. We are not yet well informed about their efficiency, but it seems logical to use them in the treatment of cerebral traumatic diabetes An improved general condition and an increased strength are constant results of the use of auto-conduction.

Static baths have been used with good results in cases of traumatic diabetes and of traumatic neurosis. The treatment is given every day for 10 to 20 minutes. Static baths influence sensibility and motility, induce sleep and put digestive functions in good order. And besides, it may have a powerful suggestive action. All local manifestations of traumatic neurosis are amenable to static electricity. Anesthesias are treated by static baths or by the breeze from a point placed near the spot, or by rubbing a metallic ball over the clothes. Static electricity may be used in cases of neuralgia, neuritis, myalgia, arthritis deformans.

Galvano-cauteries have very few applications in the treatment of industrial accidents.

Indirect electrical procedures include mechanotherapy, vibrotherapy, thermotherapy, and phototherapy.

Vibratory massage is used in contusions, effusions in joints, neuralgias.

Thermotherapy may be used under two forms; (*a*) dry heat applied directly on the skin with an electric thermophore, especially in cases of traumatic arthritis; of effusions, or by the use of a dry hot air localized bath; (*b*) radiant luminous heat.

Phototherapy has no place in the treatment of industrial injuries.

X-rays play a very important part, but only for diagnostic purposes.

Electrodiagnosis must be used to perfect the diagnosis and the prognosis after traumatisms of the central nervous system. It is very useful in cases of dispute as to permanent incapacity. It is the only safe diagnostic means in such cases. It is the best way to detect simulation and to determine the real condition of a muscle or a group of muscles.

3. A boy, 12 years old, when 18 months old had a disease that was called meningitis by the attending physician. Soon after his recovery, the child became very thin, and the whole skin began to be covered with brownish-black epidermic scales, which were constantly desquamating and growing again. All kinds of treatment proved unsuccessful, and the child could not attend school because his classmates would jeer at him on account of the peculiar appearance of his skin.

First X-ray treatment in April, 1905, rays No. 5 Benoist, anticathode 40 centimeters distant from the part treated. The head, the trunk, and the limbs were exposed successively; the whole treatment lasting 12 minutes. Two weeks later marked improvement; the desquamation has been abundant, but scales

have not grown again, and some patches of skin are healthy. Three more treatments were given from April to July, and the scaly condition of the skin disappeared entirely. After the second treatment the little patient developed an irregular nystagmus, and when cured was still in a nervous condition.

4. One of these is a Wehnelt interrupter of a new type designed to facilitate the circulation of the entire quantity of liquid from the bottom to the top of the container, and this being a large one holding 4 or 5 litres (quarts) it does not become overheated. It can be run for an hour at a time with 120 volts and 12 or 15 amperes, and runs more uniformly also in consequence of the circulation of cool liquid in contact with the platinum point. The arrangement is simple enough; a lead cylinder open at the bottom and with perforation near the top of the liquid forms the cathode and surrounds the platinum point and its stem. The heating of the liquid during the passage of the electric current produces a circulation through the lead cylinder, the hot liquid rising to the top, and cool liquid entering at the bottom.

The second interrupter is a mechanical one for use with an alternating current. There is a large permanent horseshoe magnet, between the two arms of which is placed an electro-magnet which is attracted or repelled by each pole of the permanent magnet, according to the polarity of the electro-magnet at that particular instant. The electro-magnet carries the platinum contact which makes and breaks the primary current. The electro-magnet contains two windings, one of coarse wire in shunt circuit with the alternating current, and the other of fine wire in direct circuit with the coil. The only regulation required is by screws at the point of contact so that the break shall occur at the moment of maximum intensity. The apparatus produces an interrupted current in only one direction suitable therefore for X-ray work. It will work only on currents of 30 or 40 volts or less, and so a small transformer is required if it is to be used with the electric lighting current. The interrupter of which an illustration is given is suitable for coils of 25 or 30 centimeters (8 to 12 inches). Both interrupters are made by Carpentier, Paris.

ARCHIVES D'ELECTRICITE MEDICALE

Bordeaux, France, September 25, 1905

1. Electrolysis in the Treatment of Conjunctival Vegetations — Dr. P. Pansier.
2. Technique and Uses of Radiotherapy — Dr. J. de Nobele.
3. Protective Masks for Radiotherapy — M. Care.

1. Dr. Pansier has treated about ten cases by electrolysis, and has always obtained favorable results. This is all the more remarkable because conjunctival vegetations are generally uninfluenced by most treatments. If patient is docile, electrolysis may be performed under local anesthesia. But strong applications of cocaine must be used, and even adrenalin must sometimes be added, because electrolysis under the eyelids is always painful. In children, general anesthesia is necessary.

One of the poles is placed on the cheek or on the forehead. The other, armed with a platinum needle, is driven into the vegetations, as near their bases as possible, and parallel to the surface of the conjunctiva. When the vegetations have become flat, we can either puncture or scarify them. Pricking is made perpendicularly to the conjunctiva and in the middle of the patch. Scarifications are performed with a lanceolar needle, and with a notably stronger current. Scarifications must be light, but as close to one another as possible. Current from 2 to 8 milliamperes; a stronger current has naturally a quicker action. In

chloroformed subjects, 6 to 8 milliamperes may be used and for a longer time. When cocaine alone is used, patients can seldom stand more than 5 ma. The needle must stay in the vegetation long enough. When dealing with large growths, puncture them twice. The inflammatory reaction after the treatment is very slight. Either pole may be used, but the negative is perhaps a little better. The only possible inconvenience is a scratch that may be made on the cornea with the needle during electrolysis, but this scratch disappears in a few hours without leaving any mark.

2. Mensuration of the quality of X-rays used therapeutically is easy with Benoist's or Walther's radiochronometers, but exact quantitative measurement is much more difficult.

Holzknecht's chromoradiometer is not satisfactory; Labouraud and Noire's radiometer gets out of order quickly when exposed to light, and is less sensitive than Holzknecht's tablets. Kienbock's method based on the decomposition of silver salts by X-rays requires delicate manipulations. Freund's method is the best but is still open to improvement. It is based on the influence of X-rays on the coloration of a 2% iodoform solution in chloroform. Free iodin is produced and the intensity of action of X-rays is appreciated by comparison with solutions of iodine of different known percentages. Or, if a greater precision is desired, the quantity of freed iodine may be chemically estimated. Unfortunately such an estimation is delicate, the iodoform solution is very unstable, and is decomposed readily by light. Hurmuzescu's electroscope may be used to measure the quantity of X-rays sent out by a tube.

Recently Courtade and Guilleminot have proposed a new radiometer based on the fluorescence induced by X-rays in barium platino-cyanide. The luminosity produced by a sample of radium on a screen is chosen as standard. Such a luminosity is identical in nature with that induced by X-rays and is invariable. If, in a lead plate covered with a platinocyanide screen, two equal holes are made, and if behind one, a few centigrams of a radium salt are placed, a standard luminosity is obtained with which we can compare the luminosity given by X-rays. When both luminosities are equal, a term of comparison is given by the relative distances of the radium and the tube to the screen. Or we may place the X-ray tube at the same invariable distance and modify the luminosity on the screen by the interposition of more or less thick silver plates.

Gaiffe had proposed to measure indirectly the X-rays emitted by a tube by measuring the quantity of electricity received by said tube. By his method, the hardness of a tube may also be known; but it may only be used with his transformer. (? Ed.) But the measurement of the rays emitted by the tube does not give the quantity of rays absorbed by the skin as well as Holzknecht's or other methods of direct measurement. On the whole Freund's technique improved by the choice of a more stable solution promises to prove the best.

As a rule, hard tubes must be employed when an action on deep structures, and soft tubes when an energetic action on the skin is desired. In the first case, Perthes has proposed to filter the rays through a thin tin plate which stops weak rays and lets only highly penetrating rays go through.

It is generally admitted that the quantity of X-rays the skin can absorb without developing dermatitis is equivalent to 7 or 8 H. (Holzknecht units).

Some physicians give strong doses, as much as 6 or 7 H. in one single treatment, and then wait till the reaction is over. Belot recommends giving a dose equal or superior to that which gives rise to the reaction; once he gave as much as 9 H., but owns that such a method must be exceptional.

The writer prefers milder treatments repeated every other day till a slight erythema appears; treatment is then stopped two weeks, then resumed. Some authors give first a strong dose and later on weaker treatments.

A treatment lasts from 4 to 40 minutes, according to strength of tube and to desired effect. Average duration is 10 minutes.

Treatment may be given every day, every other day, once a week, once in two weeks, according to cases.

In the skin, X-rays determine an inflammatory reaction which appears only after a latent period of two or three weeks, and is accompanied by falling off of various epidermic formations: hair, nails, etc. Sometimes serious accidents have been noted in people who have been exposed professionally for a long time to X-rays. Schlotz has proved that the epithelial tissue is, of all, the quickest and deepest influenced. Baerman and Linser contend that the primordial alteration is one on the endothelium of the small vessels; if lesions are more marked on the skin than on mucous membranes, it is because blood-vessels in the skin run parallel to the surface and are consequently exposed to the deleterious influence of X-rays.

Other cellular elements, as shown by Heinecke, are still more sensitive to X-rays than those of the epidermis or derma. Lymphoid organs, spleen, lymph glands, intestinal follicles, thymus, are the first to be harmed. Cellular modifications in these organs under X-ray exposure are deep and appear early. Bone marrow is equally affected. Lymphocytes are killed by X-rays and their elimination is accompanied by albuminuria. Red corpuscles are unaffected. The lesions of the testicles and ovaries are well known. The effects on the eye have been studied by Birsch Hirschfield; blepharitis, conjunctivitis, iritis, atrophy of the papilla have been noted. Consequently patient and operator must be efficiently protected against useless exposure. The operator may be protected by impermeable clothing, or may be placed behind a lead screen. The patient may be protected by localizers such as Belot's or Drault's. The direct covering of the tube with opaque substances, such as lead glass or special pastes causes rapid deterioration of the tube on account of the electrical condensation that takes place around the tube. Several operators have sought to localize the cone of rays in the tube itself. Chabaud has used a conical anticathode for that purpose. Dessauer has placed the anticathode in a glass sheath covered with an opaque coating, and presenting a single aperture at the inferior part just opposite the anticathodic mirror. When treating the eye special protective measures are required; Desmarre's or Knapp's forceps may be used. Nobele and Van Duyse prefer special tubes made from opaque glass or rather enamel which are well tolerated by cocainized eyes.

The therapeutical indications for X-ray treatment have been so far limited to diseases of the skin and appendages. All forms of tuberculous lupus are not equally benefited by radiotherapy, but X-rays seem to be the method of choice in lupus vulgaris, especially in diffuse forms affecting both the skin and mucous membranes. Strange enough, ulcerated forms seem to be the quickest to be influenced by X-ray treatment. X-rays act first by inducing a degeneration of the cells of the nodules, and later by secondary atrophy after the inflammatory reaction. Serpiginous and nodular forms often resist X-rays. General treatment must never be neglected, and it is often useful especially in hypertrophic cases to combine phototherapy with radiotherapy. Scarifications and galvanocauterizations must be resorted to in some cases. It has been said that radiotherapy does not give permanent cures. But a few supplemental treatments gen-

erally secure patients against recurrences, and if the latter appear, only a few nodes, easy to treat, grow at a time. The writer thinks short and frequent treatments should be given with weak intensity. Erythematous lupus is not benefited by X-ray, and is more readily influenced by high-frequency currents.

Labouraud has given precise rules for X-ray treatment of favus sycosis, herpes tonsurans, and the results are wonderful. In the treatment of hypertrichosis, X-rays have been made responsible for a permanent cyanosis, and ultimate atrophy of the skin with disappearance of the normal pigment and telangiectasi which have been sometimes noted, but such untoward effects will not be seen after careful treatment. Hair grows again, however, after depilation by the X-ray.

Alopecia has been sometimes cured by X-rays. So have been cases of eczema, psoriasis, acne rosecea, but radiotherapy is uncertain in its results in that class of diseases.

Pruritus has often been relieved, even in the most obstinate forms. Warts disappear quickly under the influence of X-rays.

In cancer of the skin, radiotherapy may give about 95% of cures (Hahn). The variety known as ulcus rodens is the one that yields easiest. Epitheliomas of the lip and tongue are not so favorable, but even if a complete cure is not obtained, there is a marked improvement.

Excellent results have been obtained in the treatment of scar nodules after removal of breast tumors, and in the ulcerated forms of the latter disease. Non-ulcerated forms must first be operated on; later X-ray treatment must be given to prevent recurrence. Same with uterine carcinoma.

It would be premature to assert that the cure produced by X-rays in cases of cancer are definitive. Recurrence may occur even after a long lapse of time. But protracted treatment is a good prophylaxis against late recurrences.

There is still much difference of opinion about the results in cases of deep cancers. Doumer and Lemoine claim to have cured a few cancers of the stomach. Skinner, Morton, Coley, have reported marked improvements in similar cases. Nobele has himself a very favorable case. The question remains open. Penetrating rays and a special technique must be used here.

Sarcoma, especially endotheliosarcoma of the face, is happily influenced by radiotherapy. Kienbock and Belot have witnessed excellent results in cases of mycosis fungoides. Belot recommends in the latter case very strong doses.

Moskowicz has recently treated prostatic hypertrophy by X-rays. He uses a short and wide rectal speculum through which X-rays are directed on the rectal surface of the gland.

Radiotherapy is necessarily limited in ocular therapeutics on account of the danger to the eye. Trachoma and conjunctival tuberculosis may be amenable to X-rays, though, if proper protection of the eyeball is insured.

Radiotherapy may relieve the pains of facial neuralgia and of tabes. X-ray treatment has been suggested in muscular rheumatism, and in bone and lymph gland tuberculosis.

Numerous and interesting experiments have been made in cases of leukæmia, but the results seem to be only temporary. Radiotherapy can only be considered as a palliative measure in leukæmia, and Rosenback has raised the question of the possibly noxious influence on the organism, of a wholesale destruction of leucocytes under the influence of X-rays.

The writer concludes with the wish that only graduate physicians should be allowed to use the X-ray for diagnostic and therapeutic purposes.

3. For radiotherapeutic applications

on the face, Care does not like lead masks or radiolimitators as well as masks prepared as follows:

Take a great number of pieces of gauze 14 inches long and 5 to 5½ inches wide. Fold them three times breadthwise so as to obtain strips 14 inches long and 1.6 inches wide. Place patient on his back or on the side, and oil hair, eyebrows, eyelashes, and beard. Dip strips into plaster and apply them on the face, so as to cover all the head except the tumor. Put a second layer over the first, then a third and a fourth. Polish the outer surface with the hand. After a quarter of an hour, the mask can be removed. With scissors the exuberant edges are shorn off. The mask is desiccated by a 24-hour exposure over a baker's oven. When dry, the mask weighs about half a pound and is 0.2 inch thick. Then it is abundantly coated with very hot melted paraffin, and covered with lead foil. The latter is sold by dealers in wall-papers and is about 1/500 inch thick. Four square yards cost 80 cents and is enough to cover 4 masks. The lead foil is cut in slips about 4x1 inches; these are dipped into melted paraffin and applied outside and inside the mask. A light pressure with the finger causes them to adhere. They are applied so as to have the edges slightly overlap each other. After a first layer, a second is applied with slips arranged at right angles to those of the first layer. Two extra layers are applied outside around the aperture through which the tumor is to be exposed. This gives us six layers of lead foil at points struck normally by X-rays and 4 at all other points. In order to give the mask a leaden appearance, and to insure more adhesion between the foil and the plaster, the whole mask is ironed inside and outside with a very hot sand-bag. The excess of paraffin is driven out, part is absorbed by the plaster, part by the sand; the mask becomes shining, looks as if it was solid lead, and is ready for use. When the opening for the tumor becomes too large, a 1/50 inch lead foil is pasted on it, and a suitable aperture is made with scissors. The anticathode is placed at 6 inches from the skin. After each treatment, the mask is dipped for a few instants in a 5% formaline solution. The preparation of a mask requires about an hour and a half, and can be entrusted to a skilled nurse.

JOURNAL DE PHYSIOTHERAPIE

Paris, France, August 15, 1905

1. The Usefulness of Sports in Therapy — Dr. Contet.
2. The Treatment of Arterial Hypertension by Physical Agents — Dr. A. Moutier.
3. The Influence of the Climate of Pau and of Medical Gymnastics upon Neurasthenia of Gastro-Intestinal Origin — Dr. Phillippe Tissie.

1. Sports are physical exercises used principally for purposes of recreation, and in the practice of which there is always found a spirit of struggle against a difficulty, the triumph over said difficulty being the greatest of all derived satisfactions. All bodily functions are happily influenced by such exercises; muscular power, skill, appetite, digestive power, organic combustions are increased, and the balance of nutrition is perfected. But, by close scrutiny, we see that all those advantages are simply consequences of the influence on the respiratory organs. Perfection in athletic education is directly proportional to the perfection of the respiratory mechanism, whatever may be the surrounding circumstances, and whatever may be the work asked from other organs. After a certain athletic training (the latter word having only the meaning study of exercise, and not the professional one) all functions improve, but the fundamental point is the coördination of the respiratory automatism. The good results of athletics are at first temporary, but later

become permanent. The nervous system partakes of the general improvement in nutrition; but, moreover, the development of perfection in respiratory functions and the control the subject acquires over them are very important for the acquisition of will-power and educational ability. Perception organs and attention become keener, and all unnecessary reactions, all uncoördinated movements, all hesitations are eliminated. Inconveniences (heart trouble), may be felt if the practice of athletics is carried on too actively. Such accidents will not be seen after methodically progressive training. Over-training may break down even professional athletes.

The practice of athletics is one of the best means we have to prevent the de- from the moral standpoint. This is true whatever perfection may have been attained in that particular exercise. Therefore, if we want to avoid all objections, and if we want to derive from sports all the possible advantages, we must follow a progressive gradation. When aiming at an educational result, we must resort to varied exercises and not to a single one.

The practice of athletics is one of the best means we have to prevent the development of dystrophias in predisposed subjects. There is another group of circumstances in which athletics work wonders, when we have to fight against the possible development of neuroses in subjects with hereditary antecedents. Dyscrasic patients who merely seek to avert, by special education and hygiene, the ultimate development of hereditary ailments, may be given full liberty in the choice of their exercises. But convalescents, and highly-nervous patients must begin with very elementary movements, such as "respiratory gymnastics," and increase slowly and progressively the complexity and the scope of these movements.

In acute febrile diseases athletics is naturally out of the question. In diseases of nutrition, its importance has always been recognized (obesity, gout, diabetes). In respiratory affections, the practice of athletic sports is contraindicated, or at least, must be submitted to very careful supervision. A very long time must be devoted to elementary respiratory gymnastics; other exercises may be indulged in only when the patient has his respiratory mechanism under complete control.

In diseases of the circulatory system caution is absolutely necessary. Oertel's method is too absolute and too brutal. But by a careful gradation in the exercises we may relieve cardiac hyperexcitability, and from the time we have obtained such a result, we may develop it by the practice of true sports. But, as a rule, we must forbid all spirit of competition, we must keep the patient away from all exercises requiring great speed or prolonged and energetic contraction of numerous muscles, and from all exercises he had not practiced before he became sick.

So-called functional albuminuria is benefited by the practice of athletics, but cases of nephritis must be handled in that respect in the same way as circulatory diseases. Lithiasis is an indication when there are not clinically appreciable stones in the kidney or the bladder. Inflammatory diseases of the urinary tracts are an absolute contraindication.

Functional sexual troubles, dysmenorrhea, menopause in women, impotence in men are very happily modified by physical exercises.

Dyspepsia, constipation, and perhaps cholelithiasis are improved by sports.

In organic nervous diseases, motor reeducation comes first; sports come after to perfect the result. Exercises requiring skill are to be preferred here to those requiring strength. In neuroses, hysteria, neurasthenia, sports are very powerful therapeutical agents, but a very careful gradation should be observed.

If now we consider the particular effect of each different sport, we find that gymnastics do not deserve the high rank which they have in most medical minds, unless Swedish gymnastics are meant. French and German gymnastics require too much skill and strength, and are only good for healthy people.

Walking is a sport if applied to long enough distances. It is a very good exercise, easy to increase by degrees, but which sometimes becomes monotonous and discourages patients.

Hunting requires more attention and is therefore less monotonous than simple walking, but is not always practicable.

Cycling is more readily accepted by patients than walking because more interesting. Overspeeding, and too long runs must be carefully avoided.

Horseback riding is a very elaborate exercise, developing every muscle, requiring great attention, and available at all times. Generally, after the initiation stage, patients take enough interest in this sport as to practice it without any other object than sport itself.

Automobiling may have its usefulness in the treatment of latent tuberculosis, because of the strong stimulation given to the circulation by continuous shocks of the air.

Fencing is a powerful means of developing the thorax and of modifying abdominal circulation. It is very good for women afflicted with functional utero-ovarian troubles or piles. Coolness, skill, attention are largely developed, and consequently fencing is a very good exercise for neuropathic subjects.

Swimming is a perfect exercise, but unfortunately is not practicable at all seasons. The same may be said of rowing and all kinds of boating.

2. By a proper diet we can stop the evolution of hypertension and prevent some of its accidents. The quantity of meat, especially of dark meat, must be cut down; it must not be eaten more than once a day. Wine and coffee in moderate amounts, alcohol absolutely prohibited. Diet is a capital point of the treatment of hypertension.

Drugs are of little or no avail. Amyl-nitrite may lower the pressure temporarily, as well as trinitrine, but never permanently. Burnecek's serum has utterly failed, gelatin in subcutaneous injection gives only temporary results, thyroidin is very dangerous.

Physical agents alone give uniform results. Abdominal massage lowers arterial pressure, but does not bring it down to the normal point. This treatment must be carefully watched, because serious accidents may sometimes happen.

Lukewarm douches may decrease arterial tension, but it has not yet been proved that such a douche may lower it to the normal point, and serious accidents are to be feared if the treatment is given by inexperienced hands.

Mineral waters may be used as baths or as drink, sometimes as both. Royal, Chatel-Guyon, Saint Galmier, Spa, are examples of the first class, Evian, Contrexeville, Vittel, of the second, and Bourbon l'Archambault and Bourbon-Lancy.

The waters of the first class contain carbonic acid gas. They produce a lowering of arterial pressure, but probably after a temporary increase. Artificial carbonic acid water baths may be used, but this form of treatment is contraindicated in marked cases. Caution is here as necessary as in the use of massotherapy or douches.

High-frequency currents, under the autoconduction form, give very good results in arterial hypertension. The instrumentation consists in a large solenoid connected either with a D'Arsonval-Gaiffe apparatus, or with a 10-inch spark induction coil, the latter being connected itself with a Contremoulins-Gaiffe interrupter and an oil condenser; in both cases the street current is used. If a portable installation is desired, an equiv-

alent coil with an atomic interrupter and connected with a battery must be used.

Our solenoid is a continuous wire cage without a door, which is far better than a condensation couch. By the use of autoconduction, we have always been able to reduce arterial hypertension when the patient was willing to submit to treatment for a sufficiently long period, and followed at the same time an appropriate diet.

The lowering of the pressure is permanent, and the arterial pressure remains normal. Some of our patients have been watched regularly for three years since they were treated, and their arterial pressure has never become higher, and this, without any further treatment on our part.

In other patients, on the contrary, we have noted elevation in the arterial pressure, but we have always found such an increase to be due to intercurrent diseases, or to habitual constipation, or to dietetic infractions. We fear less a marked infraction in diet provided it remains single, than slight daily indiscretions. This question of diet bears a direct relation to the results obtained with electricity.

Rapidity of fall in the pressure does not seem, as a rule, proportional to the gravity, long standing or even degree of hypertension. But it is in close, very close connection with the diet of the patient.

Sometimes we may see a delayed lowering of pressure in patients who keep strictly to their diet. This is seen in patients with various organic lesions or in constipated people.

In patients having a rather marked hypertension (20 to 23 H. centimeters), but who have been on a good regimen for a long time, pressure may be lowered to 15 centimeters by two treatments. Same with most of Huchard's "presclerosis" and Vagueg's "instables."

Generally, normal pressure is attained after 6 to 10 treatments; when more are necessary, one of the following causes is always to be found: organic lesions, dietetic infractions, constipation. But we have never failed to reduce the pressure to the normal point after 15 or 20 treatments. In some cases we must continue the treatment after that limit.

Auto-conduction does not produce any vaso-constriction, and consequently the decrease of pressure is never preceded by even a temporary increase as happens or may happen with most other physical agents.

With another mode of application, with another mode of electrization, with other apparatus, high-frequency currents may be used to increase arterial pressure.

But hypotensive patients submitted to D'Arsonvalisation often experience ill effects from such a treatment, if we are not careful to increase their pressure after by high frequency and high tension currents.

We must watch our patients in order not to lower arterial pressure below the desired point.

We have never seen any accidents during or after treatment; once in a while, especially at the start, we have found symptoms of mild catarrhal gastritis which always yielded to a cathartic.

In some patients, hypertension is a defensive reaction; for instance in cured consumptives. This is the only contraindication we know to the use of autoconduction.

3. The acclimatization of neurasthenic patients at Pau is sometimes difficult, and is either marked by greater depression, or by excitement. Depression is often accompanied by a feeling of debility and need of sleep. Appetite is increased sometimes and consequently dyspepsia becomes worse, because such patients take only, or rather are able to take, very limited exercise. Neurasthenia of gastro-intestinal origin is therefore aggravated.

But, if the patient follows medical ad-

vice and takes the proper diet, sedation is obtained in two weeks; appetite and sleep are restored. Psychical troubles are aggravated during acclimatization, and later disappear.

The climate acts by the luminous sky, the hygrometric condition of the air, the absence of strong winds, and the calm of Nature. Gastro-intestinal neurasthenia disappears quickly, if the climate is aided by special gymnastics. Drugs are systemically left aside.

The main point is to exercise the muscles of the thorax and abdomen and the diaphragm. Walking up an incline produces a most useful intestinal auto-massage, and can be easily graded. Such an exercise is all the more excellent because it relaxes the always tense mind of neurasthenic patients. Fatigue must be carefully avoided.

JOURNAL DE PHYSIOTHERAPIE

Paris, France, September, 1905.

1. Local Action of High-frequency Currents on Phlegmasic Conditions of Tissues — Drs. Oudin and Ronneaux.
2. Blue Light Baths and Their Analgesic Action — Dr. Albert-Weil.
3. Respiratory Education and Gymnastics in the Treatment of Rhino-Adenoidians and Pulmonary Tuberculosis, with Special Reference to "Graucher's Apex."

1. Three facts may explain the favorable action of high-frequency currents on inflammation:

(*a*) Circulatory modifications. Capillaries contract strongly, skin blanches; later on vaso-dilatation occurs. As a consequence respiratory movements become deeper. Vaso-constriction probably explains the analgesic action of high-frequency currents in infected lesions.

(*b*) Increase in nutritive exchanges. This is shown by changes in the osmotic pressure, and by the abundance of local perspiration consequent upon glandular activity.

(*c*) Rise in temperature, which can go as high as almost half a Fahrenheit degree. This may seem slight, but the increase takes place as much in the deep structures as near the surface.

Whatever may be the explanation, clinical results are good. In old, sluggish ulcers, high frequency effluvia works wonders. Pain disappears first and improvement is often noticeable from the first treatment. Varicose ulcers improve slower than simple ulcerations.

Tuberculosis of the skin or of the lymphatic glands is also much benefited. Acute and chronic simple adenitis is cured rapidly. Gonorrhea itself and gonorrheal arthritis may derive good effects from high-frequency currents. Post-Traumatic sequelæ are amenable to the same treatment.

All local rheumatic manifestations, arthritis deformans, sciatica, hydrarthrosis, infectious pseudo-rheumatism cases are quickly improved, if not cured by the same method. Visceral phlegmasic conditions have not yet been treated thus, but the writers relate a case of Bright's disease that was much improved. Oudin has obtained a very good result in a case of pulmonary congestion, and in a case of pleural adhesions.

When high-frequency currents are used in the treatment of consumptive patients, a certain number of clinical phenomena are always noted: a reduction of fever and dyspnoea, improvement in appetite and sleep, decrease and even disappearance of night sweats, improvement in coughing and expectoration; increase in weight. But unfortunately this improvement is only temporary in many cases; after a few days' respite the disease resumes its progressive course. In a few cases, however, it continues and becomes more marked every day, and finally the patient gets well on the way to a permanent cure. Such apparently contradictory results the writers account for by the fact that, in the latter class, inflam-

matory reactions surrounding weak tubercular lesions are the chief element, while in the former group, real tubercular infections predominate.

The writers have used indifferently two forms of apparatus. First a bipolar Oudin resonator connected with a spark device formed of four Leyden jars, the internal armatures of which were coupled two by two and excited by a 20-inch spark Ruhmkorff coil; the latter using the 110 volt continuous current, and a mercury dip interrupter giving 15 to 30 interruptions a second. The second apparatus, much more powerful, was a monopolar appliance worked by plane condensers charged by a closed magnetic circuit working on an alternating current (Gaiffe's Transformer ?).

With the first apparatus the patient is connected with the upper extremity of one of the resonators: either in cases of large surfaces by a metallic conductor held in the hand, or by a pad of metallic fabrics (commercially known as tricotine) applied *loco dolenti* when treating an organ presenting two surfaces such as joints or lungs. The effluvium is given through a metallic brush connected with the other extremity of the resonator. This brush is kept in the same place at the proper distance from the skin in case of small surfaces, so as to make the effluvium pass through the joint or the apex of the lungs under treatment. In cases of large surfaces the brush is moved from place to place.

With the unipolar appliance, the technique is the same, with the exception that the part on the metallic electrode is connected with the lower spiral of the resonator while the brush is directly connected with the upper end of the latter. Resonators must always be regulated to their maximum efficiency.

The metallic brush must be kept far enough away not to get any sparks. Treatments last from 10 to 15 minutes and are given every other day or twice a week. At the end of each treatmnt, after the effluvium has been stopped, a few sparks are drawn from the patient during 10 or 15 seconds by simply moving the hand over the skin, or still better an electrode of metallic fabric which avoids unpleasant sensations to the operator. It is always best to use the most powerful current because vaso-motor reactions, which consitute the efficient curative element, are proportional to the intensity of said current.

2. A clear distinction must be made between phototherapy, thermotherapy, and light baths. Phototherapy is the therapeutical application of arc-lamp radiations from which all calorific rays have been eliminated by special devices. Thermotherapy is the therapeutical application of heat propagated either by conductibility, or by radiation. The group of light-baths includes all therapeutical measures in which are utilized thermoluminous radiations sent by incandescence or arc-lamps.

Light-baths may be general or local. General baths are subdivided into six different kinds, according to the nature of the luminous source: ordinary incandescent bulbs, blue glass incandescent bulbs, red glass incandescent bulbs, naked arc-lamps, or the same with a plate of blue or red glass interposed. They may be given to the patients in the standing or the recumbent position; generally they are constructed so as to be given to sitting patients, and then they are formed of wooden cases covered with mirrors, or better by enamel plates on which the light-producing sources are fastened.

The writer has devised a special apparatus which enables one to give any of the six above-mentioned kinds. It contains 144 incandescent bulbs (48 white, 48 blue, 48 red), and 4 ten-ampere arc-lamps arranged two by two. The bulbs are inside an octagonal solid mahogany case, lined with enamel plates formed in five vertical panels, and on a horizontal

half-circle beneath the chair. Each panel and the half-circle carries 8 lamps of each color, and a marble wall-plate with 18 switches enables us to light each group of lamps separately. No rheostat is necessary to regulate the intensity; the bath is more or less powerful according to the number of bulbs turned on, 8, 16, 24, 32, 40 or 48. The arcs are fastened on the outer surface of the apparatus and enclosed in half-cylinders of nickel-plated copper closed at both ends. The regulating rheostats and the switches are fastened on the same marble plate as the switches for the bulbs. The light emitted by the arcs goes into the cabinet through rectangular apertures cut in four of its sides; said apertures may be left open or covered with blue or red glass plates. Local baths may also be of six different kinds. Those given with incandescent bulbs may be given in the open air, or in a closed space; in the latter case the lighting source and the treated part are wrapped together in a blanket. The writer uses for local light baths huge parabolical reflectors having in their center bulbs of at least 32 candle power.

General blue light baths are highly sedative, and are a method of election of treatment for all hyper-excitable patients, for neurasthenics with "algias," for those suffering from insomnia, and in a general way, for all patients having nervous erethism. Local blue-light baths give good results in neuralgia, localized arthritis, pruritus.

The writer has treated so far 10 patients, some with neurasthenic algias, others with muscular rheumatic pains. All have been cured by blue-light baths, averaging 104° to 122° F. in temperature, given at first every day during two weeks, and later every other day or twice a week. After each light bath of from 15 to 30 minutes' duration, followed in most cases by a 5-minute lukewarm water bath, most patients have felt unusually comfortable and quiet. Such an improvement lasted at first a few hours and finally became permanent.

Local baths have given just as good results in 6 cases of neuralgia. In the case of a 70-years old man who had suffered for two weeks from severe and almost continual intercostal neuralgia, an improvement was noticed after the first treatment, and a permanent cure was obtained after 15 treatments. Same result in a case of sciatica which had proved rebellious to any other medication. In two cases of monoarthritis, daily treatments of 3/4-hour duration, gave marked relief; but the oedema did not disappear as quickly as the pain.

3. The author gives the name of rhino-adenoidians to all cases presenting an anatomical obstacle to respiration between the nares and the epiglottic aperture. Those who, without having an anatomical obstruction, nevertheless breathe through the mouth may be termed pseudo-rhino-adenoidians. To the latter class must be added those with respiratory abulia. All those classes of patients may, if they have a strong constitution, develop strong muscles and a strong body; but the thorax remains too small in comparison with the rest of the body. Such a condition they call thoraco-corporal dissociation. If their constitution is not strong enough, zones of lack of pulmonary expansion, tracheobronchial adenopathy and "Graucher's apex," *i. e.*, incipient tuberculosis, appear in succession. Respiratory reëducation and gymnastics are the natural complement to surgical interventions, removal of hypertrophied tonsils or adenoid growths, resection of turbinated bones or of the nasal septum, etc. The progressive evolution will almost certainly be checked by the physiological treatment following the anatomical treatment.

In rhino-adenoidians, treatments given at first every other day and later twice

a week must be continued till signs of respiratory insufficiency have totally disappeared. If those signs should recur, treatment must be resumed. The average duration of the whole treatment is three months.

In cases of "Graucher's apex" treatments must be mild at first, and become progressively more vigorous; simple respirations, unilateral movements, bilateral and progressive movement are the different factors. Increase in weight and in thoracic expansion, decrease in the physical signs are certain results.

Dr. Rosenthal relates 8 such cases cured by his method.

Classical general medication must be used concurrently with respiratory re-education. If there be any dyspeptic symptoms, special attention must be directed thereto.

Respiratory re-education and gymnastics are powerful prophylactic means against pulmonary tuberculosis in rhino-adenoidians and in patients showing "Graucher's apex," but their action is most irregular and unreliable in cases of confirmed pulmonary tuberculosis.

Holzknecht has observed by means of the fluoroscope that certain cases of healed pleurisy not followed by respiratory re-education exhibit a lateral displacement of the mediastinum. Rosenthal's thoracic measurements are made from the spinous process to the mid-sternum at the same level on each side and both in inspiration and expiration. An interesting case was that of a child of 11 breathing through the mouth in spite of the normal permeability of the nasal passages. The child was small and poorly developed. Bilateral mensuration showed a respiratory expansion of 8 centimeters (3 inches) but measurement of each side separately showed that the amount of expansion on one side was one-third of the other side. This case was easily cured by respiratory re-education.

MISCELLANEOUS ABSTRACTS

ELECTROTHERAPY

ON THE IMPORTANCE OF DIFFERENTIATION IN THE USE OF ELECTRIC MODALITIES

A. D. Rockwell, *Medical Record,* October 7, 1905

This paper was read at the September, 1905, convention of the American Electro-Therapeutic Association, at the Academy of Medicine, New York City.

After alluding to the generic character of the term "Electricity" and the wide variety of its manifestations, Rockwell ventures the opinion that the majority of physicians who are doing electrotherapeutic work, whether as a side issue in general practice, or as in some sense specialists along this line, have failed to take a broad and comprehensive survey of the field upon which they have entered, and are unable to define the principles which underlie the therapeutic uses of this agent.

As an illustration he refers to a physician who had made much use of electricity, and had consulted him as to its use in a case of pelvic pain. He suggested the high-tension current by the bi-polar method, but the physician succeeded only in inducing in his patient, a delicate, nervous, young woman, a most violent tonic muscular contraction. The result was hysteria, increase of pain, and a general nervous breakdown, from which the victim has by no means yet

recovered. In addition, the physician was threatened with legal proceedings which have been prevented only by much tact, aided by some substantial pecuniary consideration.

In this case the trouble was caused through ignorance of the relation of quantity or volume and tension, and the measure of their combined or respective influences on living tissue, together with unfamiliarity with the mechanism of the apparatus employed. It was desirable to produce a sedative effect through the use of the high-tension coil. Through high resistances such as the skin, the high tension current exerts a vigorous action, while an induction current of low tension through the high resistance of the skin, acts much less vigorously. Now on the other hand, when applied through the low resistance of a mucous membrane, the high-tension current acts with little vigor so far as muscular contractions are concerned. Its effects are gentle, sedative, and barely perceptible. On the contrary, the induction current of low tension and increased magnitude acts as powerfully through the low resistance of the mucous membrane as do high tension currents through the high resistance of external surfaces, but producing effects that are irritating and decidedly painful.

A little personal experimentation will readily convince one of the striking difference in the action on nerve and muscle of these varying combinations of magnitude and tension. It is very easy accidentally to demonstrate this principle to the injury of the patient and the astonishment and chagrin of the physician. (This is what may very readily occur and what actually did occur in the case above recorded.) A bi-polar application with the current of tension is being made to some one of the mucous surfaces. The patient complains of an uncomfortable sensation which may or may not be due to the action of the current, and the slide is shifted so as to exchange the current of great tension, but negligible magnitude, for one of lesser tension, but appreciable magnitude, which, according to all the experiences of external application, is infinitely weaker. Instantly a shock is occasioned, associated with the acutest pain and rigid contractions, that astonishes the operator and terrifies the patient. In all this reference is made to that much-neglected, but eminently-useful modality commonly termed the faradic current, the physiologic and therapeutic action of which varies within its range of power in the same way as do high frequency currents.

In the use of the latter the author has had frequent occasion to differentiate between its various manifestations, and has seen illustrated in a very positive manner, these relative therapeutic as well as physical effects. It will be conceded that nutritional effects in greater or less degree attend the use of every electric modality; it is indeed this fundamental idea of its nutritional effects upon which in great measure must be based its utility in medicine.

That it works both ways, that alternating currents of high voltage may disturb as well as improve the processes of nutrition has been recently observed among the employes in great power houses, where exposed for long periods of time to such influences grave functional disturbances of nutrition are not infrequent. The writer's use of high-frequency currents has been mostly with static electricity as the initial force, connected with the ordinary condensers, and for the primary and secondary coils, wires respectively 25 and 200 feet in length, and it seems to him after a considerable experience that with this arrangement we get the two extremes of high-frequency effects that will accomplish about all that can be expected from more elaborate combinations.

The current from the secondary coil with its tension and enormous frequency but without magnitude, yields, as one would naturally infer, results that are quite superficial; valuable for its effects upon the periphery, but much less efficient so far as constitutional or deeply-seated nutritional effects are concerned.

The current from the primary coil with lower tension and frequency but with far greater magnitude, not only influences the periphery and superficial skin lesions, but exercises a distinctly deep-seated nutritional effect.

An interesting confirmation of this fact was recently observed in a case of pseudo-hypertrophic muscular paralysis. Muscular paralysis of this type is admittedly an incurable disease. During the course of his experience a number of such cases have been subjected to a thorough course of electrical treatment, including continuous and static methods, but never with the slightest benefit. The developmental tendency to tissue growth which is its essential element, has thus far baffled every effort. While, like locomotor ataxia, this disease is progressive, there are often seen, as in the latter condition, periods of retardation and apparent arrest, so that certain drugs such as arsenic and phosphorus have been supposed to exert a distinct influence in, temporarily at least, arresting the progress of tissue growth, but thus far there has been no satisfactory proof that this arrest is anything more than a part of the natural course of the disease. What was interesting in two cases that came under Rockwell's observation was not simply an apparent arrest, but a very positive improvement under the influence of high-frequency currents of magnitude, administered, not by the indirect method of D'Arsonval, or the method of auto-conduction as it has been termed, but by the administration of the spark itself by the direct bi-polar method.

Further progress has not been and in all probability will not be attained, and the progress of the disease will not be permanently checked, but the cases illustrate in a very interesting way, the superiority of magnitude over pure tension and frequency in influencing the nutritive processes, and is but another illustration of the importance of differentiation. The rationale of the superiority of currents of magnitude in not only ameliorating the symptoms of many organic conditions, but aiding in the cure of deep-seated congestive conditions, may be explained by its superior vaso-motor influence with relief of blood-pressure, improvement in nutrition of degenerated nerve cells and consequent development of potential energy.

The superiority of the continuous current of magnitude (galvanic current) over all other manifestations of electricity for the relief of inflammatory exudates, is or ought to be too well known to need any emphasis, and yet it is not uncommon to find physicians using other forms of electricity and especially high-frequency currents, in the belief that they were utilizing the best methods, forgetting that the rationale of the action of electricity upon all inflammatory exudates, is based upon its chemico-physical action, and that in the continuous current of magnitude alone do we get appropriate and satisfactory electrolytic and absorptive effects.

Reference was made to the combined electrization or the transmission to the body through the same electrodes of the direct and to-and-fro currents (the galvanic and faradic). To determine its distinctive value is certainly more difficult than to differentiate between the individual modalities of electricity. It is very much a question of practical experience aided in some degree by our knowledge of the physical and physiological actions of the various modalities. Each of them possesses a certain limited power to relieve pain, one succeeding where another

fails, and the reason for success or failure can often be accounted for through misapplication, the application of stimulating effects where sedative effects are called for, and *vice versa*.

Combined electrization is not efficient for the relief of pain in any such degree as the various single manifestations of electricity. On the contrary it is more likely to increase than to decrease any form of pain, simply because its combined mechanical and chemical or electrolytic action is bound to act counter to the effect desired, whether it be sedative or stimulating. On the other hand its musculo-sedative effects are pronounced, rendering it distinctly more valuable in the relief of spasmodic conditions than any single modality.

Reference was also made to the superior effects of galvano-faradization in the treatment of constipation and enterocolitis, results which have been emphasized by some others, notably by Bordier and Delherm.

SOME OF THE MANIFESTATIONS OF ELECTRICITY AS THERAPEUTIC AGENTS

A. E. Smith, *North American Journal of Homeopathy,* October, 1905

Smith considers that electricity produces its beneficent action by intensification of the normal bodily metabolism whereby diseased tissues are enabled to effect their own regeneration. He reports the following cases, all of which were given homeopathic remedies in addition to the electricity, however.

Case I.—Sub-peritoneal fibroid of the uterus, age of patient not stated. Treatment consisted of the continuous current, negative pole, consisting of a cotton-covered ball electrode, in the vagina; positive electrode placed on the abdomen. From 20 to 40 ma. were used for 20 minutes daily for two and one-half months, which was followed by a reduction in the size of the tumor and practically complete relief of symptoms. For the following year she received no treatment, after which period some of the symptoms began to crop out again, and she was advised to have the mass removed surgically. The tumor was larger than when she discontinued the electricity, but not as large as when she first came under treatment.

Smith then resumed the electrical applications as at first and continued them for nearly nine months, during the last five months of this period the intervals between treatments being gradually lengthened to one week. At the end of this time the tumor had practically entirely disappeared, and within a year she gave birth to a seven-pound child with a perfectly normal and easy labor. There has been no return of the tumor to date.

Case II.—Diagnosticated as fibroma of the broad ligament, occurring in a woman 47 years old. This patient was treated the same as *Case I* for six weeks, but no benefit followed. A gold-plated, bayonet-pointed, steel needle insulated to within one inch of the point was then passed into the mass through the vagina, and 90 ma. of current used for ten minutes. This application was repeated seven days after, and a week later the cotton-covered ball electrode applications were resumed, the treatments with the needle seeming to have softened the tumor considerably. After this when the tumor seemed soft to the touch Smith used the positive pole in the vagina with a copper ball electrode; when it seemed firm he would use the negative pole. This was kept up for fourteen months, after which the mass had entirely disappeared, and the patient has been for two years without any indications of the old trouble.

Case III.—A case of lupus vulgaris involving the whole of the lower eye-lid in a woman 74 years old. She was treated with three to five-minute expos-

ures to a medium soft X-ray tube excited by a 16-plate static machine, daily for thirty days, the tube being placed within 12 inches of the sore and the sound parts being protected with lead foil. Treatment was then changed to static brush discharge, ten minutes a day, for 30 days longer, after which the patch had entirely healed.

Case IV was one of life-long constipation in a woman 24 years old who never had a movement without taking a cathartic or a suppository; cause probably atony of the muscular coat of the rectum. She was treated with the Morton wave current "reinforced by the Leyden jar current taken from positive side of machine, negative pole grounded, outer coverings of jars coupled together, self-retaining rectal electrode, well anointed with jelly of gum tragacanth, introduced into the rectum, and the patient seated on the insulated platform; machine operated at a high rate of speed, and discharge rods separated until the hair on the patient's head vibrated perceptibly with every discharge of the machine. Twenty minute treatments were administered daily until she had normal and unassisted evacuation of the bowels every morning; then one or two days were allowed to intervene between the treatments. The whole number of treatments taken was 22. Over one year has now elapsed since the treatments were discontinued, and her bowels continue to move once a day without assistance."

Case V. — Chronic suppurative cystitis and prostatitis of several years' standing. Bladder was washed out once a day with 1 to 500 pix-cresol solution and the continuous current applied, positive pole in the rectum resting against the enlarged prostrate, negative pole on the abdomen; current strength from 5 to 10 ma. for 20 minutes daily. After four weeks the pus in the urine was less, but no other change was apparent. Galvanic applications were then discontinued and a glass vacuum urethral electrode was introduced through the entire length of the urethra, and connected with the positive pole of the static machine, negative side grounded and discharge rods separated until the glow in the electrode was bright purple in shade. These applications (Morton wave current. Ed.) were given for 20 minutes each day. After 20 treatments he was enabled to dispense with the use of the catheter, and after six weeks had to use it only occasionally at night. These applications were continued daily for two months and then given on every other day for a period not stated, at the end of which time the pus had entirely disappeared from the urine, and for several months previous to publication he had been able to dispense with the catheter, and could go from four to six hours during the day, and from six to eight hours in the night without urinating. Size of the prostate has been reduced one-half and general health greatly improved.

Smith expresses great confidence in the future of electrotherapy, and believes that work now being done along these lines will result in the acquisition of ability to differentiate positively between currents as regards the one which should be applied to given pathological conditions; that we shall be enabled to know positively just what modality to apply to any given case in order to get definite results.

THE HIGH-FREQUENCY CURRENT IN NON-TOXIC AMBLYOPIA

David H. Coover, *N. Y. Med. Jour. and Phila. Med. Jour.*, October 14, 1905.

The author reports nine cases treated by the high-frequency current. In every case a permanent improvement in the vision of about one-tenth immediately followed the application of the high-frequency current, and after a few sittings, six or seven, the maximum possible vision

was reached. Improvement has continued in all these cases.

"It is evident," the writer goes on to say, "that we must again open the question whether there is such a thing as amblyopia ex anopsia, and that the latest definition of congenital amblyopia by Heine as 'a stationary condition' must be amended. What condition is present in these cases we may not yet conclude, but there can be little doubt that the lesion is retinal.

"These cases were tested and examined before the publication of Heine's article, 'Scotoma in Amblyopia,' hence the effect the current may have upon the scotoma is as yet undetermined. It seems likely, however, that at least in the cases where the scotoma is only relative, for red and green, we may expect it to disappear. We have also to record its favorable action upon strabismus in one case, the squinting eye soon resuming a normal position.

"In the literature of the subject little can be discovered concerning the action of high-frequency currents upon the tissues. The most pertinent statement thus far encountered is the following from Freund: 'When acting beneficially, high-frequency currents modify the process of nutrition in badly ulcerative conditions and in paretic states of certain tissues, thereby promoting the healing of the former and the resumption of function in the latter.'

"While no case has yet appeared which has not been improved by me with the high-frequency current, the number which has regained normal vision is relatively small; it may be that we have here to deal with retinal anaesthesia or unawakened function super-imposed upon a permanent condition. A certain number of those who cannot be made to read 20/20 may have some lesion outside of the retina. In this connection the conclusions of Coburn should be mentioned. After examining 37 infants stillborn, or dead soon after birth, and collecting reports of 700 other similar cases, he finds, on the average, 20 per cent. showing retinal hemorrhage."

CURRENTS OF HIGH FREQUENCY FROM A STATIC MACHINE

Frederick de Kraft, *N. Y. Med. Jour. and Phila. Med. Jour.*, September 30, 1905

De Kraft, after describing the origin and characteristics of high-frequency currents goes on to say that to increase the output from the Holtz machine to the Leyden jars it is necessary to increase the difference in potential between the positive and negative side of the machine, otherwise our machine will be, in a measure, short circuited, and we shall fail to procure an efficient current to work with.

To this end he has had constructed a series spark gap interrupter, which consists of a glass tube over which are placed, at equal distances, 30 brass rings. This is mounted on rubber and provided with a rod by means of which one or all of the gaps can be placed in circuit. This interrupter is placed in the circuit between the negative side of the machine and the negative Leyden jar. By this means he has been enabled to obtain a current of greater amperage, higher voltage, and altogether improved efficiency.

Thus one can easily obtain a current for auto-condensation up to 650 or even 700 milliamperes, as measured by a Wappler hot wire meter.

While the patient is on the auto-condensation couch we can draw mild sparks out of any portion of his person; vacuum tubes will light up beautifully if brought to within a few inches of his body, and still more so if placed directly in contact with the patient. We can thus combine general with local treatment. He has used his form of auto-condensation with success in cases of gonorrhoeal rheumatism, uric acid diathesis, phthisis pulmonalis, diabetes mellitus, and alcohol-

ism. In obesity it accomplishes at times very quick reduction in body weight.

The physiological effects of currents of high frequency may be summed up briefly, viz., increase in general nutrition; in the depth of the respiratory excursions; in the excretion of CO_2; in bodily temperature; in the activity of the sweat glands. The urea and uric acid excretion becomes normal.

THE ETIOLOGY AND ELIMINATION OF DIABETES

G. L. Curtis, *Medical Record,* October 14, 1905

This paper was read at the September, 1905, convention of the American Electro-Therapeutic Association, at the Academy of Medicine, New York City.

Contrary to all accepted authority, the author contends that *diabetes is never a primary disease;* it is merely, he declares, a frequent concomitant symptom or sequela of either an inherited or acquired condition of the system which *is* primary and which is as amenable to appropriate treatment as any ordinary disease.

The unsuccessful and unsatisfactory results which, up to the present time, have attended all proposed methods of treatment, is attributed to the fact that its pathogenesis has not been properly understood.

Derangements of the liver, the kidneys, the nervous system, and the spleen have, each, in turn, been considered the offending cause of this most serious affection, and there is probably no case which does not exhibit a lesion of one or more of the organs mentioned. But as the "immediate cause of diabetes is something which interferes with the proper oxidation of certain elements of food, and as the presence of sugar in the urine occurs from, or is accompanied with, lesions in organs differing greatly in structure and function, may there not be some common cause which, owing to an inherent or acquired weakness of one or the other of the organs mentioned, is able so to interfere with its normal action that oxidation is inhibited to a degree sufficient to induce the affection we are considering?"

The author not only believes this view of causation to be correct, but he is satisfied that he has discovered the common cause, — "the disturbing element which is responsible for the existence of every case of diabetes irrespective of the nature or location of the lesions to which it most directly relates."

"*This common and potent cause is syphilis, — that Nemesis of evil doers, which ruthlessly invades every organ and tissue of the body, and with its blighting touch vitiates every secretion and deranges every function.*"

"This discovery is not the forced assumption of a theory; it is one of the results of the observations and investigations begun 25 years ago, and carried on for a long period, for the purpose of discovering the cause of interstitial gingivitis, a suppurative disease of the alveolar process."

"I found that a great many of those afflicted with gingivitis also suffered from diabetes. Finally I discovered that in all patients affected with interstitial gingivitis, of systemic origin, syphilis, either inherited or acquired, could be traced, and that in spite of careful and thorough surgical and dental treatment a permanent cure could not be effected until the patient was subjected to a course of anti-syphilitic treatment.

The diagnosis cannot always be satisfactorily made from the history of the case, but "fortunately there are ways of determining the existence of syphilis independently of any history the patient may give. Syphilis never invades the system unaccompanied by tell-tale signs of its presence. The most important and reliable of these signs are first, the eschar of Curtis which may be seen upon the surface of the gums, cheeks, tonsils,

pharynx, and, sometimes, upon the cornea and sclera, and, second, the syphilitic spores which the microscope reveals in the freshly-drawn blood. The latter sign is of special importance because the presence of the spores is not only positive evidence that the suspected disease exists, but their disappearance, later, under the influence of appropriate treatment, is indisputable proof that the specific poison has been eliminated, and, consequently, that the treatment may be safely discontinued."

"Since diabetes is never a disease *per se,* but merely an occasional accompanying symptom or sequela of syphilitic infection, the best treatment is that which will most readily and thoroughly eliminate the specific poison which caused it."

The most reliable and satisfactory treatment is that supplied by electro-ozonation. A brief outline description of the apparatus which supplies electro-ozone is given. It consists, practically, of an ozone generator fed by a high tension coil which multiplies the voltage of the commercial current a million or more times, and practically eliminates all amperage. To the generator are attached brushes or corrugated wires from which ozone is generated in large quantities, and, by a wire coil, a Geisler or other vacuum tube is connected through which ozone is forced into and through the body.

Connected with the apparatus is an electric cabinet which generates light and heat coupled with ozone.

Although treatment by electro-ozonation, alone, is able to eliminate every vestage of syphilitic taint from the system, still, in order that the patient may have the benefit of the eliminative effects some drugs are able to produce, such alteratives as mercury and iodide of potash, and such tonics as iron and veratrum viride are generally prescribed in addition.

While the doctor is convinced that anti-syphilitic treatment by drugs alone is sufficient, in many cases, to eradicate both syphilis and diabetes in their initial stages, he is satisfied that a large percentage of such cases is incurable without the aid afforded by the current.

During the past seven years 20 cases have been treated by the method advocated. "All of them had either acquired or inherited syphilis. With the exception of two, all were restored to health with every symptom of diabetes eliminated. Of these exceptions one was lost sight of, and the other was suffering from epithelioma. The average time required to bring about this result was about three months. The sugar usually disappeared from the urine by the end of the second month.

In only one of the cases successfully treated has there been any return of the sugar, or of any other symptom. In this case after several days of high living and alcoholism, a mere trace of sugar was discovered. "Otherwise the patient who, when first treated, was invalided, and whose urine contained 9 per cent. of sugar, is now in robust health."

This result, in the opinion of the doctor, is sufficient not only to substantiate his claim that he has discovered the real cause of diabetes, but also to demonstrate that this affection need no longer be considered incurable.

In regard to the restrictions of diet so irksome to the patient, but so universally believed to form an indispensable part of all successful treatment, the doctor, under the method of treatment he pursues, finds them entirely unnecessary.

"Allowing," he says, "that the sugars and starches are the food elements from which the system derives the greater part of its vital energy, it seems to me that their restriction is more prejudicial to an invalid than to a person in a state of health. Under no circumstances do I enjoin my patients from using the carbohydrates freely, and it is to this fact that I attribute their comparatively rapid recovery, for so great is the nutritive

power of electro-ozonation over the processes of digestion, assimilation, and elimination, that, under its influence the system is able to derive all of the nutritive benefits these highly important foods are able to bestow."

In conclusion, the doctor urges physicians "to test this method of treating diabetes." If electro-ozonation is not available, use the ordinary anti-syphilitic treatment; but if the two can be conjointly used, the desired results will be not only more satisfactory, but more speedily attained.

RADIODIAGNOSIS

THE PHYSICAL BASIS OF THE ROENTGEN RAYS

Hans Mayer — *Medicin. Klinik,* August 13, 1905

Professor Roentgen showed in 1895 that those parts of the glass wall of a Crooke's or Hittorf tube, which by being illuminated with cathode rays appear in green fluorescent light, themselves emit invisible rays which the discoverer later on called X-rays on account of their enigmatical behavior. Roentgen rays arise when cathode rays, which are produced under high potential differences, strike upon ponderable masses. Besides such photochemic and fluorescent effects as belong to the ordinary light rays, and especially the ultra-violet rays of short wave length, they possess the power to penetrate bodies that are opaque for the ordinary light rays.

The property exhibited by the different metals to emit Roentgen rays when lighted up by cathode rays varies in degree; aluminum and iron possess the smallest, platinum and lead the greatest power of emission. Observation shows that this power of the metals is directly proportional to the chemical atomic weight.

In other solid and liquid substances there has been found as yet no law in this connection; gases struck by cathode rays emit Roentgen rays to a small degree only.

In the Roentgen tube of today this property of the metal with a high atomic weight is made use of, and the anticathode is best made of platinum; but platinized nickel will also do, as Roentgen rays are in the main produced superficially.

Concerning the nature of the Roentgen rays two opinions prevail. One compares the Roentgen rays with emanating, rapidly-flying little particles; with the cathode rays. The other theory sees in them only vibrations of the ether. Walter defined the Roentgen rays as moving particles, as cathode rays which when striking the anticathode lose their former electric charge; therefore a magnetic field will not divert them.

Further researches, however, proved this theory untenable, so that the other one, according to which the rays are vibrations of the ether, is today generally prevalent among physicists. Prof. Kaufmann said in a paper on the electrons, "An electron flying with such immense rapidity must, of necessity, when striking a solid substance send an explosion-like electric wave into space just as a striking projectile starts a sound wave; there are good reasons for the assumption that the Roentgen rays are such waves."

The modern idea about the nature of the X-rays, which finds their generation in electro-magnetic impulses, is based on the following:

The cathode rays consist of moving material particles, the electrons, which have a considerable electric charge. If such a cathode ray particle flying with great velocity, strikes a solid substance, *e.g.*, the anticathode or the glass wall of the Roentgen tube, an ether impulse of

extremely short duration is caused. Such an impulse consists of one single wave, *i.e.*, the ether particle performs only one vibration, its velocity is changed only once in a very rapid manner. The ether particle is strongly diverted from its equilibrium, and returns to its former position without periodically swinging around its point of equilibrium. The emitted wave in this case might lack the negative amplitudes, it takes the character of a momentary impulse of the ether.

Light waves on the other hand which present themselves as waves of electro-magnetic energy consist of a long series of coherent waves. Here the ether particles when their balance is disturbed perform a great number of vibrations before they return to their own small swinging amplitudes.

A Roentgen ray consists of a single wave, of an electro-magnetic impulse, of an ether impulse.

In consequence of their character as strong, short electro-magnetic impulses, Roentgen rays on their way carry a much greater energy along than ordinary light waves.

The special kind of Roentgen rays will always depend on the generating cathode rays; the varying velocity of the cathode rays, the varying tension of the electrodes, will influence the emitted electro-magnetic impulses both as regards the electro-magnetic energy and the wave length. Partial discharges in Roentgen tubes produce locally, inhomogeneous X-rays. The Roentgen rays are called hard or soft according to the degree of tension which is used in producing the generating cathode rays.

The degree of absorption and the chemical behavior show the difference in the rays. The harder the tube the more penetrating are the rays.

The absorbability of the Roentgen rays depends upon the velocity of the generating cathode rays and of the electrodal tension; the higher the exciting tension and the greater the velocity of the cathode rays, the less are the Roentgen rays absorbed. The Roentgen rays constituting a pencil of inhomogeneous rays, exhibit varying degrees of absorbability. The absorption of the Roentgen rays is, in consequence of their being waves of a different kind, entirely different from that of light waves. As mentioned before, the ether particles vibrate periodically in the light waves, the impulses follow each other in rapid succession in opposite directions; the light waves therefore are absorbed in a medium only, *i.e.*, from the light wave energy passes into an electron only when the latter vibrates in resonance with the oscillating light ether particle.

In the Roentgen rays, however, energy is withdrawn from the electro-magnetic, ethereal vibrations by the electrones of a material medium, independently from the reciprocal actions between the individual electrones. Thus the absorption of the Roentgen rays primarily depends on the density of the substance, on the number of electrones in the unit of volume, and is therefore an additional quality of the smallest parts of a substance.

The absorption of the Roentgen ray is a certain function of the atomic weight of the chemical elements of the radiated substances.

As in electro-magnetic impulses the negative amplitudes of the energy may be absent, the impulse communicated to the electrone by the electro-magnetic quality of the ether is not compensated by an impulse in the opposite direction, but the electrone retains the energy; this explains the phenomena connected with the absorption of the Roentgen rays. Owing to the very strong, short impulses the X-rays are able to produce, in the neutral state of the electrones, powerful effects which may disintegrate the molecular structure.

Haga and Wind made some experiments calculating the length of such an ether impulse in the Roentgen ray. They

found values which are about 3000 times smaller than the wave lengths of the shortest light waves, viz., the ultra-violet light (smaller than 0.397μ).

Sommerfeld and J. J. Thomson had similar results based on purely mathematical calculation, and the fact that the wave length of the ether impulse falls into the size of the molecular dimensions is significant for the effects of the Roentgen rays, especially their faculty of penetrating opaque bodies.

Roentgen rays, as ethereal vibrations, do not carry electric charges, and in this respect differ essentially from the cathode rays. Neither magnetic, nor electric forces divert them from their course.

But the experiments also showed that the Roentgen rays, essentially differing from the light waves, cannot be reflected nor refracted; interference, flexion, or polarization also could not be demonstrated. This goes to show that the Roentgen rays are not a series of coherent waves similar to the light waves, but are due to single extremely short, but strong electro-magnetic ethereal impulses. The extremely short wave length of the ether impulses of the X-rays explains the lack of reflection, refraction, and polarization, and the radical differences between them and the common light waves.

The velocity of the Roentgen rays must be equal to the velocity of light or the velocity of the electric waves, inasmuch as that the Roentgen rays are due to an electro-magnetic impulse of the ether. The French physicist, R. Blondlot (Nancy) thought to have proved this by experiments; for he found for the examined rays the same velocity as for light rays or Hertzian waves. But as Blondlot recently says, his experiments hold only good for the N-rays which he originally mistook for Roentgen rays. It is left to the future to clear up this point.

Roentgen rays ionize the air, *i.e.*, the Roentgen radiation renders the air an electric conductor. The ionizing of a gas by Roentgen rays is always in connection with an absorption of it, for the X-rays deliver a part of their energy in the form of potential ione energy, to the ionized (originally neutral) gas molecule.

If Roentgen rays strike any ponderable substances, *e. g.*, metals, the struck or radiated places emit rays, the so-called secondary rays (Sagnac). The emission is not only superficial, but secondary rays are also generated in the inside of the substance by the penetrating X-rays.

The emitted secondary rays are composed of different kinds of rays. Among them have been found Roentgen rays, ultra-violet light and cathode rays, which means that they can be divided into rays which can be magnetically diverted and into rays which cannot be diverted. The absorption of the secondary rays is much greater than that of the primary Roentgen rays, and the secondary radiation therefore causes a much more intense ionizing of the gas. The excitatory centers for the secondary radiation are wherever ponderable parts of a substance are struck by the primary rays; in gases where the rays are diffusely scattered a secondary radiation takes place, but it is considerably weaker than in metals in which the intensity of the secondary rays is also directly proportional to the atomic weight.

The fact that the secondary rays possess much less penetrating power, and are much more easily absorbed is the reason why the rays which are produced within the primarily struck body hardly come to the outside, only those secondary rays which are generated in the uppermost layer of the Roentgenized substance.

A metal plate traversed by Roentgen rays emits secondary rays both from the front and from the back.

The presence of common light rays (ultra-violet rays) in the secondary rays is explained by the fact that by small,

not very strong impulses the electrones of the body are thrown out of their equilibrium and then return to it through periodical vibrations. But if the ether impulse is powerful so that the electrone is dissolved out of its neutral union, there will arise cathode rays, moving electrically-charged electrones.

As already mentioned Roentgen rays exhibit also chemical effects, they cause a change in the molecular and atomic structures of the smallest particles; thus a photographic plate is darkened. Furthermore, Roentgen rays cause a fluorescence in certain chemical compounds (Platino-cyanide of barium, strontium sulphate, glass, etc.).

A variety of the chemical effects are the physiological effects of the Roentgen rays, which are also to be traced back to the above-mentioned causes of Roentgen ray absorption.

RADIOTHERAPY

A CASE OF TUBERCULOUS OSTEITIS TREATED BY X-RAYS

G. Everhart, *American Journal of Surgery*, October, 1905

The patient was a boy of 10 years who came under Dr. Everhart's care in April, 1903. His left leg was edematous and very tender on pressure. Over the crest of the tibia was an ulcer the size of a half dollar which communicated with the bone by a fistulous tract through which discharged pus and fragments of bone. Fluoroscopic examination showed the tibia to be thickened throughout its length, and necrotic in the neighborhood of the ulcer. The discharge from the wound was examined by Dr. Canby of the College of Physicians and Surgeons of Baltimore and reported tuberculous.

The entire leg, well coated with vaseline, was exposed daily for five minutes of X-rays from a "soft" tube. The lesion showed marked signs of improvement after the 14th exposure, after which the treatments were given every other day instead of every day. Progress towards healing was steady, and after the 49th exposure the wound was entirely healed, and the patient has remained well as far as Dr. Everhart knows.

THE CURE OF CARCINOMA BY MEANS OF THE X-RAYS

Heinz Wohlgemuth, *Interstate Medical Journal*, October, 1905

This case was reported to the Roentgen Congress at Berlin, and is believed by Wohlgemuth to be an evidence that the X-ray is capable of beneficially influencing deeply-located cancer.

Patient was a woman 76 years old. "Seven years ago she first observed a nodule in her left breast, which within the next four years gradually increased to the size of a hen's egg. At that time it had reached the skin and formed a suppurating sore. A surgeon advised amputation of the breast, which was refused by the patient. She applied a boric acid-zinc paste to the ulcer at the time when she first came under my care in November, 1904. At that time she looked decidedly cachectic, complained of very acute pain in the left mamma which prevented her sleeping at night, and caused her to moan, and at times to yell out loud while she was awake. Just above the left mammilea a tumor was found about the size of an apple, hard, movable against the underlying ribs, with an ulcerated surface measuring 6.5 cm. The sore bled easily, was covered with a yellowish-green secretion,

no reddening of the surrounding tissue. In the left axilla a lymph gland could be felt, size of hazelnut.

"Protecting the surrounding tissue, the tumor was exposed to the X-rays three times a week, five minutes each time. A hard tube was used at a distance of 25-30 cms., motor-quicksilver current interrupter. The following observations have been recorded: Most pronounced was the immediate effect of the radiation upon the pain. It gradually became less and disappeared after four weeks. From one treatment to the next the progress of the epithelisation could be observed, which started from the edges of the sore and advanced centripetally. The ulcer became smaller and flatter by a reduction in the size of the tumor. After 52 applications of the rays, sore and tumor had completely disappeared, and in its place is found a soft, flat scar. The enlarged lymph gland had disappeared about 2½ months after the beginning of the treatment.

"This tumor has not disintegrated under the influence of the rays as I have seen it do in a case of cancer of the uterus; it melted away; it has been resorbed like an acute inflammatory swelling. This particular form of *restitutio ad integrum,* in my belief, is due to the careful dosage of the rays, a visible reaction of the skin having always been avoided. Once when the skin became reddened and the patient complained of pain, I discontinued the treatment for one week."

The condition of the breast at the time of publication was perfect, and her general condition was entirely satisfactory. A claim is not made that the cure of this case is permanent, as too short a time has elapsed, and as there is still a small gland which he proposes to have removed for microscopic examination. But he feels that the case indicates that with proper technique the X-rays can be used successfully even for deeply-located cancers.

MYCOSIS FUNGOIDES AND THE X-RAY

A. J. Markley, *Journal of Cutaneous Diseases,* October, 1905

The case occurred in a woman aged 49 years, and had existed for two years before coming under Dr. Markley's notice, at which time her condition was as follows:

"Thin, nervous and emaciated, skin a peculiar tawny yellow, very dry and rough to the touch.

"Over the face, neck, chest, back, shoulders, thighs and lower parts of legs, in fact, over the entire body except the arms and inner surfaces of thighs, were dusky red, indurated, rounded patches varying in diameter from one-half inch to three inches, the intervening skin being dry and harsh. On the outer surface of each thigh near the knee were two nodular tumors, the size of English walnuts, but no fungous or ulcerating growths. Everywhere were excoriations, due to scratching in efforts to relieve the intense and persistent pruritus. The skin of the arms and hands was dry, rough and harsh, showing no infiltrated patches, but intensely itchy. The scalp was dry and glazed, and the loss of hair was quite extensive.

"Treatment with the X-ray was begun at once, using a soft tube, at a distance of eight inches, exposing each area five minutes, making about 12 different exposures at each seance, and two seances a week at first. In addition, mild and soothing anti-pruritic lotions were prescribed.

"After the third week improvement was marked, the pruritus was greatly relieved, and the infiltration and redness were much reduced, at the end of six weeks practically all of the patches had disappeared, and the skin was soft and smooth, but very deeply pigmented; after this but one treatment a week was administered, and these were directed

chiefly against the arms, where the condition of roughness and dryness was much more persistent and resistant to treatment than the infiltrations had been. During the following five weeks the improvement in her general condition and appearance was very gratifying, she was able to sleep, regained her appetite, and in the latter part of July went to a country place for recreation, the first she had been able to enjoy in three years.

The points of special interest are:

"First, the extremely rapid evolution of the disease.

"Second, its unusually wide distribution.

"Third, and most important, the almost miraculous manner in which the condition yielded to X-ray treatment."

THE PRACTICAL TREATMENT OF LUPUS ERYTHEMATOSUS

Thurston Gilman Lusk, *The Post-Graduate*, October, 1905

The present-day treatment of lupus erythematosus by external applications, etc., is described, and the statement is made that sometimes this type of lupus involutes spontaneously. Of the use of the X-ray he says:

"I have yet to see a single case improved by the X-rays, and I have had several cases treated by this method, as well as having seen many so treated by others. Two of the cases shown by me tonight have had from four to eight months' treatment by means of the X-rays and high-frequency current, and without the slightest improvement. I have seen many cases made infinitely worse by such treatment. It is only fair to state, in this connection, that I have seen excellent results from these methods in lupus vulgaris."

During the discussion of the paper this view of X-ray therapy in lupus erythematosus was also acknowledged by several others.

THE TREATMENT OF ULCERS BY MEANS OF ULTRA-VIOLET LIGHT

Dr. Axmann, *Münch. Med. Woch.*, September 5, 1905

The ultra-violet rays were generated by means of Schott's Uviol lamp which utilizes the spectrum of mercurial vapor.

Ten ulcers of the leg of six weeks to three years' standing were submitted to the ultra-violet uviol rays. The patients belonged to the working class, and were with one exception old people. During the treatment they were not detained from attending to their work. All cases were cured in four weeks at the longest. The highest number of radiations of half an hour's duration was eight, the lowest three. Besides an indifferent dressing of boric acid ointment was applied.

During radiation the ulcerated, pus-covered parts changed to light red in color, and became partly dry after half an hour. The next day they presented a solid, red border and the same granulations. The surrounding skin became reddened and smooth. Pains disappeared and the patients were able to move with more ease. In one case the ulcer was healed after two radiations.

MECHANOTHERAPY

SOME LIMITATIONS TO KINESITHERAPY

Harlan P. Cole, *North American Journal of Homeopathy,* October, 1905

In a paper read before the National Physical Therapeutic Society, Dr. Cole makes some points clear that will appeal to the beginner in medical gymnastics as rather novel, and not after the rules of the text-books, but to the experienced practitioner in these methods they will seem a sensible résumé of the physical and physiological facts that have been impressed on him during his whole series of cases.

He first emphasizes the influence that exercise has in removing venous blood with its load of poisonous material from the tissue that would otherwise have its vitality and recuperative power lowered.

A second point is made in discussing the causes of paralysis where he shows that the groups of muscles that move a joint are not of equal strength, and that consequently if all the muscles about a joint were equally affected the apparent resulting paralysis would be found in the extensors, supinators or abductors, because the antagonistic muscles are stronger, and in the competition of slight activity they over-extend the weaker and thus increase the paralysis. "The difficulties that we have to treat, then, may not be due to the loss of nerve force alone, but to the changes that are brought about in the part, through the loss of the balance of power, by the forces brought to bear upon it. For example, if a joint like the ankle is held in place by four sets of muscles, one in front, one behind, and one at each side, and one set of these muscles becomes paralyzed or gradually gives way from being overburdened, that part of the joint that was normally supported by these muscles changes to an abnormal position, being crowded there by the weight that it cannot longer support."

A third point is made that a muscle, in order to maintain its integrity, must be able to move its insertion. In this connection he speaks favorably of the Lorenz method of breaking up adhesions, so that the parts may functionate, rather than the dividing of structures.

A fourth point is made in a consideration of the mechanical changes that may limit the movement of muscles by placing them at a mechanical disadvantage for work, and the unusual points of pressure cause reflex irritation that seriously obstructs improvement.

A fifth suggestion comes in pointing out the effect that the removal of a source of reflex irritation may have on the general health, and on very remote and apparently unassociated parts. The facial expression often conveys to the careful physician the information on which his diagnosis and prognosis are both founded.

A sixth point is well made in reference to spinal curvatures that are often caused by inequality of the length of legs. A statistical study of the relation between scoliosis and shortness of one leg was made by Dr. George E. May, of the University of Michigan, and among the milder cases as found among students, over 75 per cent. of them had this defect of the legs to the extent of a centimeter or more. There seems to be a somewhat interesting exception to the rule, when we come to cases that have a wide deviation from normal in this respect, for where the legs are so unequal as to forbid the attempt to stand on both feet at once scoliosis does not result.

A seventh point is emphasized in the treatment of sprains, where arterial blood is needed for reparative processes, and where exudation of lymph should not be allowed to accumulate as will be the case if the part is left inactive. The sprain usually indicates a condition of abnormal weakness in the part affected.

The last point of this most valuable

paper refers to the physiological need of complete motion of the joints. This matter is emphasized in all the better schools of medical gymnastics in Sweden, and by the exponents of Swedish methods in this country, and its importance is such as to warrant this being left as a climax to the paper, which we shall hope to have continued at some time in the near future.

REST AND EXERCISE IN TUBERCULOSIS

Wm. B. Stanton, *New Albany Medical Herald*, October, 1905

The modern treatment of tuberculosis is summarized under three heads: Abundant and nutritious food; a maximum amount of fresh air; a careful regulation of exercise.

There is pretty uniform consensus of opinion regarding the value of food and ventilation, but there is no such agreement as to the place of exercise in the daily life of the patient. While the value of exercise in properly selected cases is very great, the harm that may be done by injudicious exercise is much greater. The great problem in each case is to obtain a condition of normal or supernormal nutrition.

The body may be considered a bank in its keeping of an account of its receipts and expenditures. The deposits are the foods assimilated; the drafts are the nutrition used up in the ordinary physiological processes, in the muscular work done, and in repairing the tissue lost by the processes of the disease. The deposits may be increased by proper additions to the food and fresh air, but the drafts on this deposit can only be diminished by lessening the amount of work that is done.

The amount of work that is to be allowed to a patient must depend upon several conditions: (1) Temperature, (2) pulse rate, (3) respiratory rate, (4) degree of emaciation, (5) condition of other organs, as heart, kidneys, etc. Constant body temperature of 100° or above should indicate absolute rest in bed, or if the case is ordinarily afebrile, but temperature is raised to this degree by a cold or other excitant. Ordinary remittent temperature — normal or subnormal in the morning and elevated in the afternoon — requires rest in bed if the temperature rises to 101°.

The pulse rate is a guide to the regulation of exercise. It may be safely said that a pulse rate of 120 or over indicates absolute rest, but with all other conditions favorable a rate as low as 110 would permit the patient to be up at least part of the day. When the pulse is as low as 100 the exercise may be gradually increased. When the respiratory rate is as high as 30 while the patient is at rest exercise should not be attempted.

The degree of emaciation is also a guide in determining the amount of exercise that should be permitted. When the patient is greatly reduced in weight, even if other signs are favorable, the patient should be kept quiet, and even if dressed should be required to sit or recline at least two hours each day, and all cases should sleep at least nine hours each day.

The form of exercise that is to be recommended must depend on a number of circumstances. Passive exercises can be employed where the patient can afford the help of an expert, but unfortunately this is not frequently the case. Of active forms of exercise walking is the best, because easily regulated and always available. It can be regulated as to distance, as to grade, and as to speed. In institutions where there is work to be done this will be found to be more interesting than a purposeless walk, and the mental effect of purposeful work is always helpful in imparting cheerfulness and courage.

AMERICAN ROENTGEN RAY SOCIETY

The Sixth Annual meeting was held at Baltimore, Md., September 28-30, 1905, under the presidency of Dr. C. L. Leonard of Philadelphia, the following papers being read:

Study of the Stomach and Intestines — Dr. Henry Hulst, Grand Rapids, Mich.

Skeletal Development — Dr. P. M. Hickey, Grand Rapids, Mich.

The Interpretation of Lung Negatives — Dr. G. E. Pfahler, Philadelphia, Pa.

The Diagnosis of Aneurisms — Dr. Frederick H. Baetjer, Baltimore, Md.

The President's Address: The Past, Present, and Future of the Roentgen Rays — Dr. Charles Lester Leonard, Philadelphia, Pa.

The Regulation and Measurement of the Therapeutic Dose of Roentgen Rays — Dr. E. G. Williams, Richmond, Va.

The Technique of the Roentgen Treatment of Keloids — Dr. O. Shepard Barnum, Los Angeles, Cal.

The Present Status of Radiotherapy — Dr. G. G. Burdick, Chicago, Ill.

Preparatory and Post-operative Treatment of Carcinoma — Dr. George C. Johnston, Pittsburg, Pa.

Late Results in the Treatment of Sarcoma — Dr. W. B. Coley, New York, N. Y.

The Roentgen Ray Treatment of Carcinoma — Dr. G. H. Stover, Denver, Colo.

The Technic of Calculus Diagnosis — Dr. Russell H. Boggs, Pittsburg, Pa.

The Treatment of Leukæmia — Dr. Joseph H. Smith, Chicago, Ill.

The Roentgen Treatment of Hodgkins Disease, Leukæmia, and Polycythæmia — Dr. H. K. Pancoast, Philadelphia, Pa.

The Treatment of Lupus and Rodent Ulcers — Dr. G. P. Girdwood, Montreal, Canada.

The Treatment of Non-Malignant and Non-Tubercular Skin Lesions — Dr. W. S. Newcomet, Philadelphia, Pa.

The Roentgen Ray in Military Surgery — Surg. C. F. Stokes, U. S. N.

The Pathological and Physiological Effects of the Roentgen Rays — Dr. J. Rudis-Jicinsky, Cedar Rapids, Iowa.

The majority of these papers, together with the discussions thereon, will be published in early issues of THE ARCHIVES; abstracts of the others follow.

INTERPRETATION OF LUNG NEGATIVES

Dr. GEO. E. PFAHLER (Philadelphia), said that in order to study the lungs accurately the negatives must be made while the lungs are at rest. The patient must hold his breath for from three to fifteen seconds. A careful physical examination should always precede the Roentgen examination in order to permit of a correct interpretation of the shadows.

The greatest field of usefulness of the Roentgen ray in lung diseases is in the study of tuberculosis. Besides assisting in making a diagnosis, it is a most valuable and accurate method of recording the lesions at the various stages of the disease. Two negatives should be made, one with the plate in front of, and the other with the plate behind the patient, so as to disclose lesions lying near the surface of the lung, and also thickenings of the pleura. The patient should be placed in the recumbent posture, except when a pleural effusion is suspected, when he is radiographed in the sitting position. The tube should be placed at a distance of 18 or 20 inches from the plate. The time of exposure will vary with the time the patient can hold the breath. This time should be accurately determined by testing the subject several times before attempting to make an exposure.

In general, the diagnostic value of the evidence obtained through the Roentgen ray will depend very much on the skill and experience of the operator. The diagnosis of various pulmonary conditions was gone into at length and illustrated by radiographs. (See THE ARCHIVES for September, 1905.)

Dr. P. M. HICKEY (Detroit) said that in cases of tuberculosis there is a most peculiar outline of the heart which often is of considerable diagnostic value.

Dr. HENRY HULST (Grand Rapids, Mich.), said that old lesions show very well, while recent ones do not. He never exposes a chest for more than one second, so as to get all the detail of the soft tissues. A good picture of the lungs is always rich in detail which may give the semblance of tuberculosis when the disease really does not exist. It is the local finding of this detail that is diagnostic. Rich detail all over the lung must be interpreted in connection with the clinical data.

Incipient tuberculosis cannot be diagnosed; it is only after there are changes in the lung that the ray can record them. A negative diagnosis is only of relative value.

Dr. M. K. KASSABIAN (Philadelphia), said that a stereoscopic picture differentiates consolidation of the lung from thickening of the pleura, from cavitation, and from other conditions. When the patient lies on the back the radiograph is different from what it is when he lies on the side.

DIAGNOSIS OF ANEURISMS

Dr. F. H. BAETJER (Baltimore) discussed the points in the diagnosis of aneurism of the aorta, and exhibited a number of negatives of this condition. He said that a pulsating shadow which does not disappear between pulsations is always suspicious. Diagnosis of aneurisms by means of the Roentgen ray possesses many advantages over the diagnosis made by a physical examination. The diagnosis can be made earlier, hence the treatment can be begun earlier; it can be planned more intelligently and the results are better. At Johns Hopkins Hospital it is a routine procedure to ray every case.

Before proceeding with the Roentgen examination, the patient should be examined carefully physically to see that there are no abnormalities of the chest or spinal column which might complicate the diagnosis. The patient is placed in the erect position with his back to the tube, which is placed at the level of the third rib at a distance of from 20 to 24 inches from the plate. Another plate is taken from the front, and the two plates can be compared as to the size and position of the shadows. By means of transverse or slightly transverse illumination it is often possible to tell whether the object seen has its attachment in front or behind. This is especially important in determining whether the aneurism springs from the ascending or descending portion of the arch of the aorta. By making the examination at two different levels the picture obtained is a composite one.

Dr. P. M. HICKEY (Detroit) referred to several cases where the surgeon, disregarding the Roentgen findings, operated with the result that the patient died on the table. One case was diagnosed as tuberculosis. The patient was sent West and died on the train from rupture of the aneurism caused by the high altitude.

Dr. GEO. C. JOHNSTON (Pittsburg) mentioned two cases of aortic aneurism in physicians who had been advised to treat the condition by Roentgen radiations, as an illustration of how little the profession as a whole knows about the use of the ray.

Dr. W. S. NEWCOMET (Philadelphia) believes that the fluoroscope has been neglected as a means of diagnosing these conditions. The essentials are to have a fluoroscope large enough to cover

the entire chest, to use it quickly, and to protect both the patient and the operator. By means of the fluoroscope it is possible to see things that the radiograph will not show, such as detail and the movement of the lungs during respiration.

Dr. GEO. E. PFAHLER (Philadelphia) while recognizing the value of a fluoroscopic examination of the chest in certain conditions, such as dilatation of the aorta that is not aneurismal, cautioned against the use of the fluoroscope without thoroughly protecting all exposed parts.

Dr. HENRY HULST (Grand Rapids, Mich.) never makes an examination of the chest without the use of the fluoroscope. He said it is better to have the ray pass obliquely between the spinal column and the large blood-vessels because otherwise an aneurism may be shown that is not there.

Although the fluoroscope is most useful in the diagnosis of diseases of the chest and heart, he does not believe that it will show more than the plate will. The plate is a better instrument than the eye. To get detail and to show minute changes, use the plate. To see respiration, use the fluoroscope. Have the body well protected, and cover the proximal side of the fluorescent screen with lead glass, which the rays will not pass through, and then there is no danger to be apprehended.

Dr. J. RUDIS-JICINSKY (Cedar Rapids, Ia.) uses both the plate and the fluoroscope in every case where their use is indicated. The position of the aneurism cannot be photographed as easily as it can be seen on the screen. In tuberculosis of the lungs the heart is always small, and that can be seen best with the screen whereby the action of the heart can be observed.

PRESIDENT'S ADDRESS

Dr. LEONARD gave a historical review of what has been accomplished in the decade since Roentgen discovered the application of the ray to medicine, and indulged in a speculative discussion on the identity of the ray, its chemistry and physiological action. He outlined several fields in which there is opportunity for further research, and predicted that with improvement in the technic and increased knowledge of the action of the ray and its various qualities, its usefulness will be greatly enhanced.

ROENTGEN RAY TREATMENT OF CARCINOMA

Dr. GEO. H. STOVER (Denver) uses a ray of good mellow quality that will penetrate the tissues, but does not place the tube too close to the surface to be treated because of the vagrant rays emanating from the tube which are highly destructive.

He permits the ray to affect the surrounding tissues to a reasonable extent, but protects the hair, eyebrows, testes, and ovaries. He does not consider it necessary to produce an erythema. If such does occur, the exposures should be stopped or the intervals between exposures lengthened. He exposes three times a week, about 10 minutes each time, with a tube distance of from 8 to 10 inches, sending the rays into the tissue from different points. He uses shields on all treatment tubes to protect himself and parts he does not wish to expose to the ray.

He believes in being conservative about recommending the Roentgen ray for glandular disease, but advises Roentgen ray treatment of all primary non-operative and recurrent non-operative carcinomas. Where there is an equal chance between the ray and the knife, he advises operation, using the rays afterward, but is not prepared to say whether immediately after operation, or when there is a recurrence.

He uses the Scheidel 12 and 16-inch coils, the Heinze 12-inch coil, Carstarphen (?) 6, 12, and 15-inch coils, 3 Kinraides (?) 6-inch Meyer coil and static machines. Some of the coils have been operated on the alternating current at 110 volts, others on direct current at 220 volts, and some by storage batteries. He has used all kinds of interrupters, commutators, hammer breaks, mercury, and electrolytic with acid or alkaline solutions. Tubes with vacuum regulation are preferred, those of the automatic type.

TREATMENT OF LUPUS AND RODENT ULCERS

Dr. G. P. GIRDWOOD (Montreal) cited 10 cases of tubercular lupus in various stages of the disease that yielded to Roentgen treatment. All were cases of long duration, one having existed for 32 years, and all had been treated surgically and by means of external applications without avail. All have been cured by the ray or relieved to such an extent that a cure is almost certain in a comparatively short time. Where a dermatitis was produced healing went on more rapidly and continued to go on without any treatment whatever. All these cases were treated at a distance of 10 inches for 10 minutes at a time. The number of interruptions to the current was about 3,000 per minute. The coils used were 18 and 30 inch; 110 to 220 volts; 2 to 6 amperes; mechanical electrolytic break; 440 to 660 watts, with no condenser in most of the cases. He also cited 11 cases of rodent ulcer treated with good result.

Dr. SINCLAIR TOUSEY (New York) uses a unipolar X-ray tube which has the general shape of a vacuum electrode. It is connected with a high frequency apparatus, and has a wire which terminates in a tiny cathodal concave mirror. The cathode rays are concentrated on a platinum disk, and it is only when in contact with the tissues that the yellow fluorescence of the ray is perceived. It is applied directly to the surface to be treated, and also produces a shower of tiny sparks from the surface of the tube which is not in contact with the tissue.

His method of measuring the dosage of the ray depends on four factors: The distance of the anticathode from the surface to be treated; the time of exposure; the quality of the ray, and the density of the ray. With the fluoroscope he ascertains the distance at which he can still get the fluorescence. If that distance is 12 inches, he gives a 10-minute exposure with rays of No. 6 Benoist penetration.

Dr. CHAS. L. LEONARD (Philadelphia) said that cases of chronic skin disease are very resistant to the X-ray.

TREATMENT OF LEUKEMIA

Dr. JOS. F. SMITH (Chicago) cited 12 cases of lymphatic leukemia, 3 acute cases, 2 subacute cases, and seven chronic cases. In the acute cases and in one chronic case the spleen and glands were not affected, but in the other subacute case and in all the chronic cases they were reduced considerably in size, in many to nearly normal. The duration of the acute and subacute cases was from 1 month to 12 months. These patients are all dead, also one case of two and a half years' duration, and another of 14 months' duration. Of the remaining chronic cases, one is in good condition, the disease having lasted 26 months; two cases are slightly improved, and three are improved considerably.

The spleen, glands, and bone marrow were exposed to the ray, but apparently it made but little difference what region was exposed, so far as results were concerned. The effect on the glands, blood, and spleen came hand in hand. The essential thing is to expose some organ that contains a large volume of blood. The greatest drop in the number of leucocytes

was in a chronic case, falling from 295,000 to 6,800. This case was of two and a half years' duration, and had been under observation and Roentgen ray treatment for 17 months. That patient had a relapse later.

The action of the Roentgen ray in these cases seemed to be of two kinds; first, local, on the spleen and glands, characterized by inflammatory reaction if the treatment is pushed vigorously, and later by breaking down and disintegration of the gland tissue; second, there is formed a leucotoxin which exerts either an inhibitory action on the manufacture of leucocytes by the bone marrow, or it destroys leucocytes that are fully formed. The blood serum of a leukemic patient disintegrates the corpuscles of normal blood. In no case did the splenic tumor disappear entirely. With the discontinuance of the treatment the disease reappears, at varying periods. Acute cases are not benefited at all, and chronic lymphatic cases respond more rapidly than splenic cases. It is probable that the Roentgen ray holds the disease in abeyance, but does not cure it.

TREATMENT OF NON-MALIGNANT AND NON-TUBERCULAR SKIN LESIONS

Dr. W. S. NEWCOMET (Philadelphia) discussed this subject in general, and stated that in most cases of skin lesions the Roentgen ray will prove beneficial.

TECHNIC OF CALCULUS DIAGNOSIS

Dr. RUSSELL H. BOGGS (Pittsburg) emphasized the necessity of being thoroughly familiar with densities which may appear on the plate, and of being able to interpret them correctly. In over 200 cases examined by him he had only two unsatisfactory results. A diagnosis should never be made from a plate until the plate is perfectly dry. If the patient is large, it requires a great deal of accuracy to show the detail necessary to make a diagnosis.

He considers the Roentgen ray the most efficient means of diagnosticating kidney stones, but experience is an essential to make the method valuable. Two radiographs should be taken, and the shorter the exposure the better, because then there is no motion of the parts. When the rays are intense enough to make a picture in less than 30 or 40 seconds, the tube used is so much lower in vacuum, hence it will give greater detail and differentiation. The radiographs should be made while the patient holds the breath. All the inverse discharge should be cut out; by using a rheostat in series with the primary of the induction coil, the amperage can be kept at any desired point.

He has had 5 cases of stone in the ureter which were diagnosed as cases of appendicitis. He always has the patient clean out the bowels thoroughly beforehand, and does not permit the ingestion of any fluids for a certain length of time before the examination. The tube distance is 20 inches. In the case of a patient weighing 150 pounds, the exposure would be 8 seconds with 8 to 10 milliamperes in the secondary circuit. He has found that calcified tubercular deposits may be mistaken for stones.

He uses the following developer: Metol, ʒ 3; glycin, ʒ 3; sodium sulphite (dry), ʒ 1½; potassium carbonate, ʒ 3; potassium bromid, ʒ 1; water, 2 quarts.

Dr. H. K. PANCOAST (Philadelphia) mentioned one case in which an error was made in diagnosis, an accumulation of salol in the bowel having been mistaken for stone. Another source of error is mistaking phleboliths for calculi.

Dr. J. F. SMITH (Chicago) mentioned as a source of error small bony deposits in the pelvic ligaments, especially those attached to the spinous process of the ischium.

Dr. HENRY HULST (Grand Rapids) rayed a case in which the shadows were very puzzling until he learned that the

patient had had a fall some time previously, and that in all probability a transverse process of one of the lumbar vertebræ had been broken off which simulated a stone in the ureter.

Dr. M. K. KASSIABIAN (Philadelphia) mentioned calcified lymph glands as another source of error, and also mentioned a case where a scar in the capsule of the kidney was mistaken for a kidney stone. In order to assist in diagnosing stones in the lower ureter, he inflates the urinary blader slightly with air, thus showing the outline of the bladder and locating definitely the ureters.

Dr. CHAS. L. LEONARD (Philadelphia) said that many of these errors can be avoided by making a plate which will show the outline of the kidney. When there is a stone in the ureter, there is always a passive enlargement of the kidney. That, he said, is one objection to the diaphragm. It is too localizing. It does not cover enough ground to show whether the kidney is dilated or not. He said that until there was some means for cutting out the vagabond rays he would not use high frequency discharges or the current derived from a main. He has had such remarkably good success with his technic that he fears changing it in any particular.

Dr. GEO. E. PFAHLER (Philadelphia) said that one reason for using the diaphragm is to cut out the vagabond rays.

Dr. SINCLAIR TOUSEY (New York) called attention to the possibility of the stone being found on the side opposite to the one indicated by the symptoms as being the seat of disease, and cited a case in point.

Officers were elected as announced on page 261 of THE ARCHIVES for November, 1905; the place of the next (7th) annual meeting is to be decided by the executive committee later.

AMERICAN ELECTRO-THERAPEUTIC ASSOCIATION

The fifteenth annual convention was held at the New York Academy of Medicine, New York City, September 19-21, 1905, under the presidency of Dr. Emil Heuel of New York City.

After the customary addresses of welcome and response, and the initial executive session, the scientific programme was opened by a paper by A. D. ROCKWELL, of New York City, entitled "The Importance of Differentiation in the Use of Electric Currents," abstract of which will be found on page 320, this issue of THE ARCHIVES. The other papers were as follows:

NON-SURGICAL TREATMENT OF INFLAMMATORY DERANGEMENTS OF THE FEMALE PELVIS UNACCOMPANIED BY PUS

Dr. ALMERIN WEBSTER BAER (Chicago, Ill.) stated his belief that in the great majority of inflammatory derangements of the female pelvis it is not the correct thing to confine oneself to the application of the "usual remedies," such as local and systemic depletories, tampons, enemas, leeches, cold or hot applications, etc. He is convinced that in the electric current we have a better means of giving immediate and lasting relief than ever before. A portable induction coil, aided by the old-time remedies, will effectually reduce congestion in acute cases; one pole should be located over the dorsal region, and the other in the vagina or uterus, increasing the current strength as much as the comfort of the patient will permit. The length of the application should be extended from 3 to 10 and 15 minutes, and in severe cases should be applied twice a day. After the acute stages have passed, the continuous current should be employed.

Dr. G. B. MASSEY (Philadelphia). The paper has been very interesting to me, and probably also to those of you

who are more or less general practitioners. I have been very strongly corroborated as to the value of the high tension currents in these cases, gently applied and slowly increased. These cases should be treated by the induction coil twice a day, which will quickly relieve.

Much was said about the use of the constant current, and it was pointed out that in nearly all these cases ovariotomy or other operation was advised, while we hear that today in cases of this kind the simple operation of the continuous current will cure the trouble. The importance of a means that would cure these people without operation, can only be appreciated when it concerns a member of one's own family. Such happened to me during the present summer when the opening of the abdomen was demanded, together with the plunging of a large hand into very important organs. The patient in this case opposed the operation. She went to the hospital. The next day the opinion of the operator was that in case of a recurrence there should be an operation the very next morning. The previous day the induction current had been applied, and she was able to leave the hospital in three days.

Dr M. W. Brinkmann (New York City). The facts which Dr. Baer presented in this paper, are such that we can all heartily endorse them from our own experience, as they are an exact statement of what can be accomplished, and is being accomplished. There is only one remark in this paper to which I am going to take exception, and that is regarding the use of drugs in the relief of pain. A very eminent English surgeon once said: "It is certainly not right to put into a body, of which you know little, something of which you know less." In effect the administration of a chemical is an empirical act, pure and simple. We have a variety of physical agents at our command with which we can paralyze the sensory mechanism, and I do not see why any others should be employed. I therefore make this appeal, especially with reference to pelvic conditions, and I believe that if the resources at our command are carefully surveyed, agents will be found to accomplish results which are frequently attempted by methods which I do not believe will exist at an early date in the future.

Dr. F. B. Bishop (Washington, D. C.). In one special case under my care the patient refused operation. She was then placed on special medicine and diet to relieve accumulated matter, and subjected to treatment by the continuous current through the vagina. In the course of two months the patient was all right.

Dr. Baer (closing discussion). The faradic current I mentioned, not because I think so much of it, but it is one you can take to the bedside. As to Dr. Brinkmann's appeal in regard to the relief of pain I may mention one most pitiful case of a woman, who was unable to sit in one position, or to sleep for two hours together, and was in a miserable condition all the time. When she came for the third treatment she said she had no pain, and inside of two or three weeks the uterus was down to the natural size and freely movable: the current did the work.

SOME OF THE CAUSES OF FAILURE IN TREATING MALIGNANT GROWTHS BY X-RAYS AND ELECTRIC CURRENTS

Dr. Robert Reyburn (Washington, D. C.) held that one of the most fruitful causes of cancer is senility or decay of the tissues; also the use of alcohol as diet, diminishing as it does the metamorphosis of tissue, and hindering the separation of waste products from the tissues. A third cause, and that upon which the author laid the most stress was excessive consumption of meat. Cancer was comparatively rare among races inhabitating hot

climates and living entirely, or almost entirely, on vegetable foods.

For the prevention of cancer, observation of correct rules of diet, health, and hygiene, and building up of the body, was of the first importance. Treatment should not be confined to the use of the knife or some form of electricity (of which the X-rays and the continuous current were the best), but should be assisted by medical treatment (upon the necessity for which the author also laid much stress) according to indications present in the individual case. Failure to observe this point was one of the causes for failure to effect a cure. Among the other prominent causes of failure to cure cancer Dr. Reyburn mentioned neglect of the patient to apply in time for treatment, and application of the X-ray or the continuous current over too small surfaces of the body.

Dr. A. C. GEYSER (New York City). Dr. Reyburn has spoken of the causes of cancer, a subject of which we should be very glad to know something definite. In some, treatment spells absolute failure, and in others the results are not satisfactory. In England a great deal of time has been devoted to this matter by the British Cancer Commission, but the final results of their labors were not satisfactory. While it is true that in meat-eating countries there is a greater prevalence of cancer, this is also true of other diseases. All patients, who consume large quantities of meat, are more subject to all diseases than those who do not, but I do not know that we can lay great stress upon that mere fact.

The accumulation of waste products in the system is a point fairly well taken, and ought to be worked up further. I am a believer in the theory that local irritation is concerned in the causation of cancer. I believe that if there is an irritation in the body it does not make much difference whether that irritation has been produced from the outside through mechanical means, or from the inside by poison or waste products. Predisposition also plays a considerable role. As in syphilis the offspring is more susceptible.

It seems to me that in spite of much that can be said in favor of the application of electricity, I would first and foremost favor the knife as a rule, and use whatever means there are at our disposal, for building up the body. Dr. Reyburn says treatment by knife is a failure, but treatment by other means is also a failure. Treatment of any other disease by most anything is a failure under some circumstances. If the cancer is superficially situated, we do have a means in the X-ray for proper treatment. In certain portions of the body, where irritation can easily take place, you can destroy the cancer cells and restore that particular portion to its normal condition.

Dr. G. B. MASSEY (Philadelphia). I feel that I cannot express approval of this paper. I am sorry to say that I disagree almost entirely with it, and think that such a paper is calculated to do great harm. In spite of the fact that we have not yet discovered the cause of cancer we all know that the reason why the knife has been a failure is because we have outlying daughter colonies of cancer cells to deal with. It does not matter whether the germ is found or not; the specific cell in a cancer, that if left alone will traverse the body, is incurable. It leaves the patient incurable even though the disease may be mitigated.

I do not think that in the present condition of our knowledge on the subject surgery, as such, should be condemned because of a mistaken assumption that surgery means the knife. The knife is not the whole of surgery. There are methods of destroying the infection without bringing about dangerous absorption. And it is just as wrong to say that medical treatment is inefficacious. We must destroy the disease at its initial site.

Also to two other points I must take

exception. It has been said that vegetarians do not contract cancer, but the investigations of the London Cancer Commission show that there are numbers of vegetarians who suffer from it. Nor can I agree with the proposition that cancer is a disease of old age. I have seen patients six weeks old, born with cancer, and I also had a patient in the hospital who was four years old, suffering from a large cancer of the lower jaw. I have also seen sarcoma of the eye in children of five years. We all know that the frequent occurrence of the disease in the old is because it was not treated in the early stages when it first occurred, in middle life, or the prime of life. I therefore deviate almost entirely from Dr. Reyburn, although I agree with some remarks made on the treatment, except the mention that the galvanic current *per se*, for this malady would be a good thing. I had one instance to show, possibly also one doubtful case, that the application of the galvanic current made the disease worse.

Dr. M. W. Brinkmann (New York City). This subject has been approached from the same side as Dr. Reyburn by Dr. Siegel and Dr. Naumann of Germany. Dr. Siegel wrote a book and Dr. Naumann an extensive essay. I must say I agree with Dr. Reyburn that surgery is a failure, and also that cancer is not a local but a general disease with a local expression, and believe the paper is a proper note of warning as the surgeon knows he never reaches the seat of the trouble. It is a crime to operate on a patient, if it cannot be absolutely demonstrated that the disease exists.

Dr. W. W. Eaton (Danvers, Mass.). I read a paper on this subject before this Association two years ago, and I then took the ground that Dr. Reyburn takes now. My position was that instead of using the knife, the treatment of the malady was under better control by the use of the continuous current, to which might be added electricity in other forms. I had treated at that time some 40 cases, in nearly all of which relief was obtained, and fairly good general condition supervened. In quite a number of cases, about 25 per cent., a perfect cure was obtained. Of these not one has in any way shown bad results. I agree with the stand taken by Dr. Reyburn in his paper. I agree with the recommendation not to cut into a part which perhaps merely shows cancerous features. I disagree with Dr. Reyburn as to the question of age, because I have had cases of all ages from children to old people of 70.

I find the best means to effect relief, if not cure, is by the application of the continuous current. I believe the effect is obtained through chemical action upon the diseased cells by which the disease is directly attacked. I would also add X-rays as another form of electricity, and also perhaps the static spray, which I have used in a number of cases. In some cases I have also obtained good results from the high-frequency current, applied directly to the part. To supplement these cases I have also a number in which operation had been performed, and in which the condition was worse than before, cases in which the best surgeons have advised the patient to come for the electric current as the only means of obtaining relief.

Dr. Brockley (Philadelphia). We all recognize the fact that electrical treatment must, to a certain extent, be destructive to cancerous growth. Whatever means be used as a destructive agency throws extra work upon the elimination. That being true, it is very necessary that we take care of that extra work. In applying the X-ray, we are not able to control some of the rays, but whether we use them, or use cataphoresis, it is to a certain extent a destructive process. My

experience is that other mechanical methods, which might be looked upon as a systemic treatment, become a very great aid, and increase the effectiveness of local treatment. I use in all cases, immediately after the local treatment, the static current, and also employ with much confidence mechanical vibration. This modality increases elimination wonderfully, and aids the system in its effort to take care of waste products. In addition I use superheated air. That also stimulates the process of elimination through the skin. By using these auxiliary methods the value of the destructive process, whatever it may be, is enhanced.

Dr. MASSEY. While the remarks made by Dr. Brockley contain good thoughts, I do not agree with him and would warn against any massage or vibration.

Dr. E. V. DELPHEY (New York City). There are two classes of cancer which are quite distinct in their locality and pathological appearances. As to the effects of the X-ray upon the tissue, the general experience has been that in a great many cases they have proved almost, if not complete, failures, because they kill part of the tissue by over-stimulation. The risk of breaking down the tissues is a serious one. One man has lost his life in this manner, another his arm, and another again his right hand. The effect of the X-rays has been exaggerated, and when it is decided not to use the knife, treatment by fire, cautery, or cataphoresis should be resorted to.

Dr. REYBURN (closing the discussion). In treating cancerous growths we should, as a matter of course, differentiate between the various kinds and select the method of treatment accordingly. I say, do not rely on one treatment for all cases, but treat the general condition of the patient. If cancer is due only to a metabolic change in the affected cells local treatment is sufficient. I have devoted a great many years to this subject and my deliberate conviction is, so far as cancer is concerned, that the knife is a failure. According to the condition of the patient add constitutional treatment to the application of the electric current. I think this method constitutes a far greater victory, than does surgical operation.

CHOICE OF METHODS IN THE TREATMENT OF OPERABLE CASES OF CANCER

Dr. G. BETTON MASSEY (Philadelphia) stated that his observations at the new Oncologic Hospital (Philadelphia) and elsewhere, justify him in concluding that early cases of operable cancer are best treated by massive mercuric cataphoresis by means of heavy galvanic currents (500 to 1,500 ma.); that the knife is most useful in the removal of an entire organ with an incipient growth, and least useful when the limits of the growth are difficult to determine; and that the Roentgen rays are indicated in early treatment, or when a superficial growth is too extensive for cataphoric destruction.

Dr. RICHARD JOSEPH NUNN (Savannah, Ga.). My experience with the use of cataphoresis and the Roentgen ray has been very favorable.

Dr. HERDMAN. My own experience in the direction of this paper has been very limited. At the same time I think I may say that I agree with Dr. Massey, where there is a large tumor superficially, too large to be amenable to cataphoresis, then we should use the knife. As a rule I object to the use of the knife, unless it is absolutely impossible to treat the affection in any other way, and in the great majority of cases the cancerous process extends beyond the growth of the tumor. The use of the knife is therefore limited to small-sized tumors. We should try to limit the focus of infection

when we use the knife for the reason that, if we use the knife for a tumor and destroy the tissues around it, then we infect. For this reason I would also like to see all operations for cancer done under ether. I believe cancer to be the result of devitalized tissue being absorbed by certain parts of the body, and when the blood of the patient is already in a receptive condition, any part of the body is liable to produce cancer.

Returning to Dr. Massey's paper, I believe cancer to be purely a local disease produced in many ways, by insufficient elimination of effete matter, insufficient hygiene; and what we want to do is to study the individual condition of the patient and replace what has been wasted by the cancer.

My own experience is rather large in this matter, and I have come to the conclusion that the treatment for this as well as other maladies should not only be by local, but also constitutional means. I hope most earnestly that all of you who are here tonight, will try to develop that idea, and in that case I feel sure that in another year we shall see very much better results in the treatment of cancer.

Dr. W. B. Snow (New York City) called attention to the combined use of the various methods, especially the knife and the X-rays, which Dr. Massey had omitted to mention, and also to the danger of secondary hemorrhage which was present in the author's method.

Dr. F. B. Bishop (Washington, D. C.). My work has not been much in the line of electro-therapeutic surgery, but what little I have done has made me look very favorably at Dr. Massey's method of treating cancer. It seems to me that the question as to which is the best method is not one to be determined by a few cases. Dr. Massey has treated his cases for a great many years, and it would be interesting to the Association if he would tell us how many cases of recurrence he has had in the course of these years. We know that in surgical cases there are many, and it would be interesting to compare the proportions of recurrences between the knife, cataphoresis, and the X-ray.

Dr. Massey (closing the discussion). Dr. Bishop's question as to the relative frequency of recurrences is difficult to answer. In both my hospital and private practice, and the latter extends back in this particular line to 1893, nearly all the cases were on their last legs, and therefore there were many failures. Often they are not recurrences, but persistences, indicating, perhaps, a diseased condition of the liver, and when such a patient dies, he may really have been cured of cancer and die of a local disease. Of my old cases, about one-third or over 30% have been more or less successfully treated; others have died of cancer without a recurrence having taken place in the original spot. Of the whole number, about 20% have really been saved and are living today. At first I failed in about 30% of cases, but this number has now fallen to about 10%.

In reply to Dr. Snow I would say that I want my cases to recover after I have done the destructive work. If you use radiotherapy first, you cannot be sure of their doing so. But that is a delicate question, as is also the question whether we shall go ahead and do what we can with these cases in view of the possibility of increasing our failures. As I have said, we have to be liberal in the classification of operable cases. Take a patient in an anemic condition, with a large cancer in the breast or uterus, under prolonged anesthesia for an hour, and assume that the operation will require considerable drainage, then her condition after the operation will be such as not to allow her to leave the bed very quickly. The trouble about following the treatment by the X-ray is a very serious one. When using cataphoresis, there is no such trouble, but in the case of X-rays

you cannot tell whether there was a cure or not.

Hemorrhage cannot be serious in a hospital. In the 60 odd cases among which a large number of operations have been done, there was only one secondary hemorrhage and that did not result in the death of the patient. The healing does not take very long, eight weeks to three months. We do not want to cover up the disease and, therefore, do not want the healing to go on too fast.

CLINICAL AND EXPERIMENTAL STUDY OF THE ACTION OF MERCURIAL CATAPHORESIS IN THE TREATMENT OF CANCER, WITH A FURTHER REPORT OF CASES

In the author's (Dr. AMEDEE GRANGER, New Orleans, La.) absence, this paper was read by Dr. Geyser. It contained a résumé of his work done after the Massey method (massive mercuric cataphoresis) of treating malignant growths. He had treated 24 cases of which 9 were operable, 11 inoperable, and 4 hopelessly inoperable. Of the first group all were cured; of the second 2 were cured, 5 were improved, 1 only palliated, 1 failed absolutely, and 2 are still under treatment; of the third group, palliation was effected in 2 cases and absolute failure resulted in 2. The regions affected were as follows:

Cranial bones	1
Eyelid	2
Lip	2
Tongue	3
Forehead	1
Face	5
Neck	2
Breast	3
Nose	1
Arm	1
Genitals	1
Cervix Uteri	1
Frontal sinus and brain	1

His experience with these cases has led him to conclude as follows:

First, we have in mercuric cataphoresis, a means of destroying not only the malignant growth, but the proliferations into the apparently healthy tissue, rendering the latter sterile and stimulating its cells to greater physiological activity. This last and most important action is due to the selective action of the current, which forces the diffused chemicals along the paths of cancer proliferations, because these have greater conductibility than the normal tissue. Besides a true selective action also results from the fact that cancer cells succumb more quickly to the diffused chemicals than normal cells.

Second, it is incapable of producing an auto-infection of the edges of the destroyed area, because no infected cells or germs can exist within the affected radius of its energy.

Third, the bloodless character of the applications, even in situations where the vascularity is great, and the tonic and stimulating effects of the current more than counteract the depressing and untoward effects of the anesthetic in old patients, and in any patient, when the size of the growth requires prolonged application. After the applications the patients make rapid recoveries, because they have not been weakened by the loss of blood attending the use of the knife or curette.

Fourth, although we have used the method on most unfavorable cases, and taken desperate chances, we had only one death during an application, and we are convinced that in that case the method was not responsible for the fatal result.

Fifth, as a cure or palliative in growths within the mouth, it has proved of inestimable value, especially so on account of the inadequacy of the other methods of treatment. We were able to harmlessly and easily transmit the cataphoric products to the site of the application by means of an electrode of small calibre and special design, so insulated as to absolutely protect the healthy

parts of the cavity, and yet capable of definite and controllable diffusion from the uncovered point of the electrode.

Sixth, in the cured cases, the cosmetic results were excellent, the resulting scars are much smaller than would at first have been expected from the extent of the wounds after the separation of the sloughs. They are soft, pliable, smooth, and with practically no degree of retraction.

Seventh, lastly, we are convinced, as a result of our experience in these cases, that although we can expect some improvement and occasional cures from this method in inoperable cases, that it should not be reserved for such cases, but be used in operable ones as early as possible, and before the local disease becomes general, if we wish to obtain a large percentage of permanent cures. And we further believe that such a result can be confidently expected.

PRACTICAL USES OF THE SINUSOIDAL CURRENT

Dr. FRED. HARRIS MORSE (Boston, Mass.) gave a description of the very pleasant alternating current which had been christened the "Sinusoidal" by D'Arsonval of Paris in 1892, although it had really been used already since 1883 by Kellogg, of Battle Creek. It could be used to advantage for a number of pelvic and spinal disturbances, although he did not recommend it to the exclusion of the other well-known electrical currents, but he certainly considered it a valuable adjunct.

Dr. CLEAVES has used the apparatus with excellent results for the kind of cases enumerated by the author.

Dr. MORTON confirmed the American origin and development of the apparatus which produced a very pleasant current. Beyond this he could not see any value in it.

Dr. MASSEY has abandoned the apparatus because it did not furnish the high contracting power which he was in the habit of using.

Dr. BRINKMANN explained that by regulating the speed of the apparatus muscular contractions could be produced.

THE RELATIVE ACTIONS OF THE ROENTGEN RAY AND LIGHT UPON THE ENZYMES, AND THEIR THERAPEUTIC SIGNIFICANCE

Dr. E. C. TITUS (New York City) detailed some experiments demonstrating the inhibitory action of the Roentgen rays upon the germination of seeds, and the evolution of the hen's egg, and also showed that the effect was neutralized by the parallel ray from a marine searchlight. Thus, for instance, he took portions of various seeds, and after submitting them to the influence of the X-ray found that no growth occurred. When, however, some of these rayed seeds were exposed to the searchlight and then planted, they began to sprout, although not as vigorously as others which had not been rayed.

Likewise fresh hen's eggs were subjected to prolonged exposure to the Roentgen rays, and when placed in an incubator for four weeks failed to show any evolution, while other eggs, which, after being rayed were exposed to the parallel rays from the marine searchlight and then incubated for the above period, exhibited different stages of embryonic development.

The author explains the divergent effects of the Roentgen ray and light on the ground that the former exert an inhibitory, and the latter a stimulant influence upon the enzymes or animal ferments which are so intimately concerned in cell metabolism.

Looking upon the matter from this point of view it was but another step to explain the action of the X-ray upon human tissue in the same manner. The author then related some clinical obser-

vations showing the effect of searchlight rays in neutralizing the injurious influence of the X-ray.

By subjecting parts which had been X-rayed to the parallel rays of a marine searchlight, all risks of subsequent dermatitis or ulceration were practically eliminated.

He considers it logical to subject persons who have become sterile from working in an X-ray atmosphere to the vitalizing influence of the electric arc light.

Another clinical fact, evolved from the author's "enzyme theory" is that by applying some material rich in enzymes, such as the uncooked white of eggs, to old X-ray burns, prompt reparative action took place when other means had failed.

Dr. W. B. SNOW (New York City) said that the valuable experiments of Dr. Titus showed that the effect of the X-ray upon enzymes was not destructive, but only inhibitory, and he hoped that the further development of this discovery would show the X-ray in a more intelligent light.

Dr. SINCLAIR TOUSEY (New York City). Some time ago, when the subject of the effect of the X-ray on the embryo, and especially on the ovarian cells, came up, it occurred to me that it would be interesting to ascertain whether ordinary exposures to the ray would have the same or similiar effects. I therefore made experiments on a cat. I started in about October 11th of last year, and made an X-ray picture holding the cat under my hands. The exposures lasted about 40 seconds. Another picture was taken in about 10 days. At Christmas there were three kittens born dead. I had supposed that the ordinary skiagraphic exposures were quite harmless, but I think they are responsible for the death of the kittens, as the cat bore healthy kittens two and a half months later.

Dr. GEYSER. No one can but admire the paper presented to us by Dr. Titus. Yet one swallow does not make a summer. At Cornell University I have charge of two machines, perhaps the largest in the country. I placed under a hen 12 eggs to be hatched. Every other day I would start the static machine and place the hen, setting on the eggs, under the X-ray. I photographed her a number of times, and to my surprise at the end of three weeks out of the 12 eggs 7 perfectly well-developed chickens had developed. It is a common thing, when setting 12 eggs, that five go wrong. On another occasion, three hatched out, but since then I have not, a single time, seen any of them come out well. I do not know whether this is due to the X-ray or to faulty eggs, but it goes to show that while one set of experiments may go wrong, in another set we may get 7 healthy chicks out of 12, which are still alive today, with a hen that was exposed every day to the machine.

September 19, 1905

Evening Session

RADIO-ACTIVE WATER AND ITS PREPARATION

Dr. WILLIAM JAMES MORTON (New York City) presented this paper which stated that, in contradiction of statements made by medical journals that radio-active water could not be artificially prepared, he had discovered a simple and effective method for attaining that result by simply placing pitchblende in water. The product had been submitted to Professor C. B. Pelham, of Columbia University, and it was, on electroscopic examination, found to be distinctly radio-active, the activity increasing, not with the quantity of water treated, but with its surface. The length of time during which radio-activity was retained depended upon the manner in which the fluid was preserved. Dr. Morton found it to exercise an active

tonic effect, and a specific action upon various kinds of cancer including the rodent ulcer type, as shown by a photograph produced. He administered it internally and applied it locally.

Dr. WILLIAM JAMES HERDMAN (Ann Arbor, Mich.). No doubt we have all been very glad to listen to this able and instructive paper. In the last few years there have been published a great many exaggerated and unfounded statements in regard to the radio-activity of water and its possibilities. Very little of this has been worthy of consideration, as very few of them were based upon scientific facts. Tonight we have had something of a definite character presented to us: Dr. Morton has shown us a simple method of producing water in which the emanations from radium are retained, and that by this simple method the production of this water is placed in the hands of every one and can be readily arranged for by all of us; and in another year we will know more of the application of this discovery to therapeutic purposes, as it will prove extremely attractive to Dr. Morton as well as to others to pursue further investigations. I have spent some little time during the last three years investigating the sources of pitchblende in this country. In Colorado it is most plentiful, but disappointing in quality. In some parts of Colorado excellent pitchblende can be obtained, as Dr. Morton has shown us, but in other parts it is not so good. In times past it has also been obtained in other localities for the purposes of general trade. In the Southeastern states and also in Texas it has been found in considerable quantities. The amount, however, contained in the rock is so small, about 2% or 3%, that as yet nothing has been accomplished with it, and no method has been devised wherebv it can be made profitably. I, therefore, hope that this Association will make a test on Dr. Morton's lines with a view to determining its therapeutic efficiency.

Dr. WILLIAM EDGAR DEEKS (New York City). I merely wish to confirm Dr. Morton's observations, having been associated with him in these investigations. I can also confirm what Dr. Herdman said in this matter. A great deal more could be said about the therapeutic value of the fluid, as we did not confine our experiments to water alone. Definite results cannot be obtained by this agency alone, but about the radioactivity of this water there can be no question at all. The simplicity of the proceeding is well described in just those words that Dr. Morton used.

Dr. GEORGE BETTON MASSEY (Philadelphia). These have been very interesting remarks about this water, which surely must be radio-active. It seems to me that in view of the serious disappointment in the treatment of cancer with solid radium we should be slow about speaking of the curative qualities of the water impregnated with this gas, and also in regard to such affections as tuberculosis and all the other diseases which Dr. Morton has mentioned. These questions are very ticklish, I mean from the point of view of actual determination of the value of such an agency, so intangible an agency. The doctor has given the one evidence of value in the picture he sent around, but that picture does not look to me like rodent ulcer. Rodent ulcer has a smoother edge.

Dr. MORTON. When that picture was taken, the case was already half cured.

Dr. MASSEY. I would like to ask the doctor if radium has ever cured rodent ulcer?

Dr. MORTON. I do not want anything better. I know of nothing better than radium. It has invariably been successful, provided the diagnosis was correct.

Dr. MORTON (closing the discussion). I have no fault to find with any of the criticisms that have been made, and welcome the remarks of Professor Herdman that pitchblende can be found

in this country pretty freely. If it can, the further work of experimentation will be all the easier for every one of us. In regard to Dr. Massey's remarks, they are not exactly justified, for the paper made no claim whatever for the treatment of tuberculosis or any of these diseases. It merely mentioned that in the diseases suggested radio-active water might be of value and successful. As to Dr. Massey's remarks that these emanations are intangible, implying by that, that they might not be of value, I may say that, of course, they are not as tangible as a case of hob-nails, but quite as tangible as burns from the sun or the arc light or any kind of heat, tangibility meaning sensibility to touch. But any such a sensibility is not a necessity for the cure of disease, as I take it.

THE ROENTGEN TREATMENT OF TUBERCULAR GLANDS

Dr. GEO. C. JOHNSTON (Pittsburg, Pa.) reviewed the various methods of surgical and medical treatment for the destruction of tubercular glands. While acknowledging the satisfactory results of competent surgery, he asserted that the Roentgen ray not only achieved the same result in a bloodless way, but also penetrated into hidden places where the knife could not reach. He admitted, however, that the treatment is tedious, not always satisfactory, requires the services of an expert, and is attended by some small degree of danger.

Dr. G. B. MASSEY (Philadelphia). Dr. Johnston has taken the words out of my mouth in regard to the dangers of tuberculous adenitis, and also in point of the serious nature of the surgical work required, as represented in the medical literature of past years. The continued use of surgical measures displays an absolute failure to recognize the splendid work that Dr. Johnston's treatment accomplishes. At the Atlantic City meeting, did I not show a little girl that was treated by mercuric cataphoresis? She was a child of the cleaner of the office building living underneath the level of the floor in unhygienic surroundings with a tuberculous mother. That little child is two or three years older now, and has developed into a young woman of excellent health.

I frequently have no opportunity of seeing my patients again after operation, but I predict that I get 100% of successes by mercuric cataphoresis in a thousand cases. Locate the center of the disease and after successful treatment of two or three of the worst glands the patient will then recover without whiskey or cod liver oil. It requires from six to eleven treatments to effect this usually.

Dr. MORTON. I did not arrive in time to hear Dr. Johnston's paper read, but knowing who wrote it, I am sure it was good. I gather from the discussion that the point is that tubercular glands can be removed by the X-ray. I add my testimony to that, and can state that there is no better way of treatment. My cases have not been many, but I can recall at least eight of which six were cured by the X-ray, although I admit that I also gave considerable doses of fluorescin. I noted in three or four later cases that I treated with fluorescin that my results are more rapid, I think by about half the time. Only bad cases come to me, by which I mean cases with tubercular glands extending from the ear to the shoulder, and in some cases there are open sinuses. They cease discharging in four to six weeks entirely and then totally disappear. I think, myself, fluorescine has a good deal to do with the success, although I should say that the suggestion made by Dr. Massey of applying cataphoresis in the center of the gland itself should be a valuable one.

I do not see why we should feel compelled to resort to the zinc needle, how-

ever. Why should we be bound by any hard and fast rule in the treatment of this disease? We change our views from day to day, science never stands still, so there is no reason why we should apply the rule of thumb, and decline newer and better methods. Certainly the knife is an inefficient factor in the work on tubercular glands, and the reason is that the knife does not find all of them. The X-ray finds those that the knife does not. Why then not adopt the more sensible policy? I can verify Dr. Johnston's standpoint and say that the X-ray cures tubercular glands, and is better at it than the knife.

Dr. TITUS (New York City). I take a personal interest in Dr. Johnston's paper because of my experience in a number of cases. I will call attention to one of those factors which are responsible for many of the cases of glands that were enumerated. They have much to do with the presence of adenoids which seem a prolific source of infection. If we use precautionary measures to remove completely all anomalous tissues, you will find in many instances that the glands can be removed without further difficulty, but in removing the source of infection, the initial step should be taken. The cause of the trouble is, I believe, due to the presence of adenoids which act as a means of reinfection. If you remove the adenoid tissue as a precautionary measure, you will have better success. I take the liberty of calling that fact to the attention of the body of the members present, because that is the prime factor in the whole situation.

Dr. HERDMAN. I rise to explain that it is not that we have no better means of attacking this trouble than by surgical methods, but that we have a richness of means from which it is difficult to select the proper one. I add my own testimony to that of Dr. Titus, that it is all a question as to the means by which these glands became infected. No attempt should be made to cure this trouble, whether it is by electro-therapeutics, the Roentgen ray, or surgical work, without first making the attempt of removing these adenoids.

There is also evidence of what Dr. Massey has already shown, that the disintegrating influence of the X-ray is a most admirable means of dealing with these glands. In Dr. Holme's Sanitarium there are chiefly only incipient case of tubercular glands, and they have evidently every convenience at their disposal. From a letter I have received, I learn that high tension and high frequency are applied. This is additional evidence that we have a rich variety of efficient means of bringing about destruction of these tubercular deposits which, if left alone, are going to infect the entire system.

Dr. M. F. WHEATLAND (Newport, R. I.). I thought mention should have been made of the fact that bad teeth are one of the most frequent sources of infection.

Dr. EMIL HEUEL (New York City). In the matter of infection, have the members noticed the probability of bedbugs being the source of infection on the same grounds that the mosquito has been found to be a disease-carrying insect? I believe this ordinary bug is one of the most prolific sources of infection.

Dr. JOHNSTON (closing discussion). In referring to sources of infection, bacteriologists inform us that the mouth in most human individuals is more prolific in the production of pathological bacteria than any other part. If we take this as our stand now, we shall probably find a very prolific source of infection in the mouth. Our dentists tell us to use the tooth-brush and rub the gums thoroughly, and if the gums are spongy, they bleed. Take the mouth with all these bacteria and use your new tooth-brush several times, producing bristly punctures in the gums, and you have the most

prolific source of infection imaginable. You cannot sterilize or boil a tooth-brush without destroying it. In the near future you will find you will have to clean the mouth and teeth in accordance with the standards of civilization, and the tooth-brush will have to go.

In closing the discussion I only want to bring out a little stronger one fact in connection with the treatment by the Roentgen ray. I called attention to the fact that the throat was a frequent source of infection, and it is my custom to examine the throat in each case to the best of my ability. If I discover anything that appears pathological, I refer the patient to a competent man to attend to it.

I believe, however, that many of these cases, properly speaking, suffer from small tuberculous foci in one of the apices. We cannot remove a focus of infection in the apex either by surgery or metallic cataphoresis; we may be able to do so later. The X-ray, however, will reach a focus in the apex of the lung, and if applied there properly, it exercises a curative effect on such focus. It also sterilizes, so to speak, every gland in the cervical chamber. It treats not only those glands which are palpably affected, but also those which are not visibly infected, being as yet unrecognizable by any other method of examination.

Second day
Wednesday, September 20, 1905

THE COSMETIC VALUE OF ELECTRICITY

Dr. LAURA VIOLA GUSTIN-MACKIE, (Attleboro, Mass.) has made a special study of the removal of facial and other superficial blemishes by means of electricity, and has always been successful. The cases included many which had been given up as incurable by dermatologists, and yet yielded to the electric current in its various modalities, treatment in some cases extending over three years.

Dr. TOUSEY explained that epitheliomata and small warts were successfully removed by the Oudin method, which consists of the application of high-frequency sparks to the wart for about one minute.

Dr. STRONG (Boston) employed a similar method by applying a metal electrode connected with one pole of the Tesla apparatus with considerable success.

MECHANICAL VIBRATION IN THE TREATMENT OF HERPES ZOSTER

Dr. WILLIAM G. SCHAUFFLER (Lakewood, N. J.) said that herpes zoster or shingles is so painful a disease, and its medicinal treatment has always proved so unsatisfactory, that any method insuring quick relief from pain, and a speedy termination of the disease should prove acceptable to the general practitioner. Such results are obtainable by the use of mechanical vibration.

The conclusions of men like Baerensprung, Kaposi, Haight, and others can best be given in Stelwagon's words: "In the main the disease is usually a descending acute neuritis, provoked by various causes. The process has its beginning frequently, if not always, in the ganglionic system in the cervical or spinal ganglia, finally reaching the terminal branches, with a production of the cutaneous phenomena. While it is true that ganglia are found affected in most cases, yet investigations have also demonstrated that the pathologic process may have its seat along the course of the nerve, and moreover, that it may take its start in traumatism from peripheral irritation, and also probably from infection. It is therefore clearly a neurotic disease, and may be said to be symptomatic of some irritative or inflammatory disturbance of the nervous tract."

Pain is so constant a symptom that its relief is of great importance, and led to the use of the vibrator, which promptly

stopped it. Schauffler now applies mechanical vibration in the place of all other treatment, except some drying powder to the skin, or bromide or valerian in very nervous cases, with the following technique:

"My routine method of treating a suspected case is to strip the patient, looking carefully for signs of eruption, and then examine the interstices of the vertebræ for tender spots. These will be invariably found on the affected side over an area corresponding to the peripheral nerves affected. Pressure over these sympathetic ganglia will elicit the characteristic pain, sometimes before any eruption appears.

"Having determined this area, I apply to it the ball of my vibrator, making deep, firm pressure in the spaces named, and also for some distance above and below. This manipulation will cause pain varying in intensity according to the stage of the disease, but this passes off quickly, and is followed invariably by distinct relief. The whole treatment lasts from 4 to 6 minutes, and I repeat it in from 8 to 24 hours. I prefer to give two treatments daily for three days, when I look for such decided improvement that one daily treatment suffices for three days more, at which time the patient is usually free from pain, and the vesicles have dried up and ceased to bother."

A number of cases were reported illustrating the efficiency of this treatment.

Dr. SNOW. I am very pleased to have heard this paper. It is quite remarkable how one man gets so many cases, and that the result of this treatment, as it has in so many instances, spells relief. If the doctor had applied another treatment together with his own, of course the paper would not be so valuable as it is now. Still, I should think that such an omission is not altogether in his favor, and that this perhaps is the reason why the doctor suggested that it might be impossible to discern external manifestations of the lesions at another point. I mention this especially, as I have found his treatment a success only in very few cases before.

Dr. BRINKMANN. I believe a good many members have obtained the same results as the lecturer, perhaps not by vibration, but also by other methods, where the nerve trunk has been involved, and where it was desirable to reach peripheral conditions. Whether the oscillatory effect be electrical or mechanical, or of any other variety, will make no difference, as long as you can operate so as to influence conditions in that trunk as you can on the periphery. I believe that you produce a pause in the sensory mechanism when the vibration is rapid and sufficiently long, but I do not know whether that inhibition of the sensory mechanism should be at the nerve trunk or the peripheral nerves. I believe that if it is applied where the spinal nerves emerge, we should be equally successful. My experience certainly bears out that of the author of the paper, but also that the very rapid faradic current will also bring about the desired result.

Dr. WATSON. I have had some experience along the lines of that paper in using vibration, but obtained the same result with less pain by the high-frequency current, using a vacuum tube, and keeping the current away at a sufficient distance from the eruption to prevent sparks. In order to get the vibratory effect in connection with the vacuum tube, I apply that direct and in contact over the source of the nerve trunk and get the same result as by mechanical vibration. I have had experience both ways, and the results were equally satisfactory. It is a question, however, in which everybody should be interested, because vibration is a new treatment in this situation, especially in connection with the electric current.

Dr. SCHAUFFLER (closing discussion). I thought I had made it quite

clear that the application of the mechanical vibration is only in the interstices between the vertebræ over the tender spot, where the sympathetic ganglia come together. In examining a patient, I always locate the tender spot alongside the spine corresponding with the nerves that are complaining at the peripheral end.

I have also tried high-frequency currents over the eruption, but have not had that satisfactory experience the doctor speaks of. Because I found that by vibration I could with absolute certainty stop the pain, I have given up the other modalities, which did not give the same relief or results anywhere near so certainly. The main thing I wish to emphasize is that, if you remember the cause of the disease, that it is a descending neuritis, there is no trouble to know where to apply the vibration, or to find out the reason why the application of vibration at the center will stop the trouble.

In this short paper I was unable to touch upon all the details of the technique, but almost every one is using vibration of some kind. I think a great deal of our success with mechanical vibration depends upon the kind of instrument we use. Each one of us has his favorite, but there are many on the market that do not do the business. The instrument which only plays on the surface is not sufficient, as it requires deep penetration to affect the nerve center in order to effect a cure in herpes zoster.

RADIANT ENERGY AND IONIZATION, THEIR RELATION TO THE VITAL PROCESSES AND THEIR DERANGEMENTS

Dr. Wm. James Herdman (Ann Arbor, Mich.) said that the phenomena dealt with in physics and chemistry lie at the foundation of all vital processes. To understand the action, both normal and abnormal, of the human body we must study the constitution of living organisms, animal and vegetable.

We find these organisms composed of substances which, in their ultimate analysis, are the same that we are familiar with in our study of the composition of inorganic things. A large per cent. of the elements discovered by chemistry enter into the true nature of living things, in some instances in combinations peculiar to living organisms. The study then of chemistry and physics should precede that of histology, biology, anatomy, and physiology. Upon the facts of chemistry and physics we must base our efforts toward ameliorating disease.

The last two decades show a great advance in the fields of chemistry and physics as regards knowledge of the constitution of matter. The electron theory has displaced that of the atom. Modern research has demonstrated that all matter consists of electrons, and that radiant energy and mechanical force are but manifestations of the movements of electrons, and of the reaction of the ether upon them. This theory has won "almost universal acceptance, as it harmonizes all the facts, points out a new mode of considering the structure of ponderable matter, and tends to bring back to a single origin all the phenomena of the physical world (Righi)."

In the light of these modern conceptions of matter all physical phenomena of whatever sort and wherever exhibited, either in the organic or inorganic world, are due to the inherent attributes of electrons, and the result of their movements and combinations. Their movements give us the various manifestations of radiant energy and of force; their combinations, their associations and disassociations, the processes of ionization, furnish us with the infinite varieties of what we term matter, living or dead.

It is therefore to a study of electrons and their action upon the all-pervading ether in their combinations and deportment in living things, to which we must look for a more intimate knowledge of the phenomena of biology and health,

perversions of which constitute pathology and disease.

All forms of radiant energy have been proved to possess the property of exciting reactions in living tissues. These reactions used therapeutically in some instances have been beneficent, in others harmful, and in still others the results have been negative.

A study of the sources, and of the conduct of radiant energy in relation to life phenomena is the most direct path to a correct conception of vital processes, and to the creation of a sound biological science. Laboratories of research in this line of investigation should be established and liberally maintained in every university and medical college worthy the name. Starting from these fundamental studies a rational and comprehensive system of therapeutics will be evolved far transcending in scope and effectiveness any now existing.

Dr. W. B. SNOW said that the study involved in the proposition placed before them by Dr. Herdman, was so vast as to make one's efforts in that direction seem insignificant, but that the field belonged legitimately to their domain and must be developed.

After some further expressions of appreciation by members Dr. HERDMAN closed the discussion as follows:

"I am thankful for the kind expressions that have been made regarding my paper. The one thing that all earnest men have constantly to bear in mind is to make the utmost use of thought and discovery in all directions. As physicians we have all recognized that we have not done what we would have liked to do in our practices. Of course, some cases must suffer from want of proper information, but we are never justified in being ignorant, in the range of professional work, of things that could have been employed to the welfare of our patients. We cannot shut ourselves off against what is going on in the scientific world and expect to be in the front in doing our work thoroughly and satisfactorily, and to the welfare of those that were entrusted to our care. So we had better be looking to the fundamental work that is going on, pointing to our own field of labor. This fundamental work we are more or less familiar with, but perhaps we have not thought of it in direct relation to our own particular work, and it is that which I want to point out. English, American, German, French, Belgian, and other scientists, all harmonize in the belief that the electron theory interprets more of the incongruous things than any other theory that has ever been presented to the world, that it explains more things than ever were before explained, and that we can use it most profitably for explanations in our work. I want to shoot with the best gun I can secure, and hit the bull's eye."

A POSSIBLE CURE FOR PULMONARY TUBERCULOSIS BY MEANS OF ELECTRICAL CURRENTS OF HIGH POTENTIAL AND FREQUENCY

Dr. JOHN H. BURCH (Baldwinsville, N. Y.) by a series of experiments upon animals, had found that if the region over which high frequency currents were applied was first painted with a medicament capable of killing tubercle bacilli, the animal would withstand the action of a more virulent culture, than when the electrical modality was used alone, by reason of the power of the current to drive medicaments through the integument. A mixture of oil of cinnamon and oil of turpentine, balsam of peru and tincture of iodine, had proved the most efficacious for the purpose. Simultaneously, unbelliferone was administered internally in order to flood the tissues with light. Of eight cases so treated, five were apparently cured, the average duration of treatment hav-

ing been two months. But it was too early yet to report definite results. Much also depended upon the efficiency of the apparatus employed.

Dr. SNOW pointed out that, wherever there is increased phagocytosis, we were obliged to get nearer the infectious element than in a case of non-complicated tuberculosis, and that the currents of large quantities did not penetrate deeply and were largely superficial.

Dr. A. VILLE (St. Joseph, Mo.). I know Dr. Burch's personal enthusiasm, his chronic devotion to a work of love. The paper we have heard this afternoon is a valuable addition to what we have learned from him before. I have also tried Dr. Burch's suggestion, using oil of tar, and applying it to the chest of the patient, as suggested, which reduced the temperature from 102° to 98° or 99° F. From time to time a bacteriological examination was made. The ultimate result I cannot say, but the patients in some respects improved. The other case did not show bacilli in the sputum; there was every indication that this patient was in a tuberculous state, but as the bacilli could not be found, he was not treated for a long time. The man has since regained his physical energy, but of what help the electrical treatment was in those two cases I do not know.

Dr. BURCH. In regard to mixed infections I found that the addition of a silver salt, applied the first time in solution, over the infected region, seemed to give more benefit in those cases. In regard to treatment of these cases, I would not for one moment advise electricity to the exclusion of other methods. I use every hygienic measure and give all suggested improvements a trial, but I also conduct the experimental work as described in my paper, although I do not know yet what the clinical results will be.

CONSERVATIVE GYNECOLOGY; ITS RELATION TO THE CONTINUOUS CURRENT

Dr. MARGARET ABIGAIL CLEAVES (New York City) explained the advantages of her methods of electric treatment of gynecological conditions over surgical treatment, laying great stress upon the use of oxydized electrodes and hydro-electric treatment. She claims for her methods better results, with a reduction and sometimes total avoidance of pain.

Dr. MASSEY: We have listened to very interesting remarks which represent the most important thought in the application of electricity in the field of gynecology. It is valuable for the general and special gynecologist. I think most of us have been neglecting the hydro-electric treatment.

We ought to remember in reference to the use of oxydized electrodes, that Dr. Cleaves is right at the top of the list of those who wrote very careful papers on this subject for this Association as well as elsewhere. I have silver electrodes, but have done nothing with them. Of course, all these processes are really cataphoric, as I said in my paper on electrolysis. All metallic electrodes are necessarily cataphoric.

Another point is this. I was surprised that Dr. Cleaves was betrayed into a kind of language that she ought not to have been guilty of. In this, of course, most of us, including myself, are sometimes delinquent. She talked of medication instead of solvents. It has been pointed out recently, since one of her papers was read on this question, that these salts are dissociated when they are in solution. Place salt in water and it is no longer salt. A great number of the atoms are dissociated, and we have nascent chlorine. I agree with Dr. Cleaves as to the care which must be exercised in the treatment of these cases.

Dr. BAER. Dr. Cleaves referred to

the application of salt solution in the vagina. Personally I use the salt solution that Jaques Reeds finds the best for osmotic pressure work. I think in that way we have a means of reaching these post-gonorrheal cases as we have never been able to reach them before, and without provoking the infection that frequently follows electric applications to pus tubes. We should follow that suggestion a little more closely than we have been in the habit of doing.

Dr. PHELPS. I want to congratulate Dr. Cleaves upon the attitude she has maintained for many years in the matter of conservative gynecology. It is sometimes difficult to get a shield that will prevent the water from flowing outside of the shield instead of through the channel which is intended for its release. It is also necessary to get sufficient pressure in order to distend the vagina, particularly if your case happens to be one with gonorrhœa.

While I believe that this is a field worth cultivating by the general practitioner as well as certain surgeons, I as a general practitioner cannot see that it is always suited for advanced cases. But could all these cases be treated early by the method which Dr. Cleaves has pointed out, no doubt thousands of lives would be saved. If you have not turned your attention to the surgical side of gynecology, and realized the ravages that are made upon woman by the gonococcus, you can scarcely imagine how much might be done in preventing surgery by following Dr. Cleaves' suggestions.

Dr. CLEAVES. Referring to Dr. Phelps' remarks as to gonorrhœa, they are as true as they can be, but in treating gonorrhœal vaginitis or cystitis, it is necessary to use very mild solutions and a mild current. In these cases I might use 2, 3, or 5 milliamperes, and gradually go up to 10 or 20 milliamperes, but I would not exceed the latter and would not commence with it. In fibrous pelvic exudates I would commence with 5 milliamperes and go up to 50. I had a case for pelvic exudates in which I had to be extremely careful, and yet there was pain. I could not introduce the nozzle of the electrode more than about an inch. You do not want to use pressure on your patients, because they do not stand it.

As regards puncture, I suppose when Dr. Massey referred to puncture he meant with a non-oxydized electrode. In my cases it was always done with an oxydized electrode at the anode.

About dosage, I hold that 30 milliamperes is the limit. I never exceed that except in malignant conditions which is another matter. But I hope that in another year we will hear from Dr. Massey that he can do the work with fewer amperes.

Dr. MASSEY. To do it is the thing.

Dr. CLEAVES. Yes, you are right. I have often had conversations with physicists, and talked over Dr. Massey's method with them. In the course of these conversations the question has arisen whether the effect is produced by the mercury or by the current. I do not know. I am speaking of malignant conditions.

Dr. MASSEY. It is both the mercury and the current.

Dr. CLEAVES. Yes, but can you not do it with less current?

Dr. MASSEY. It depends upon the case.

Dr. CLEAVES. The action of electrolysis and cataphoresis are the fixed properties of the current upon which we depend, but as Dr. Massey has never used the mild current, he does not know how well patients like it.

Dr. MASSEY. You jump from the Apostolic puncture to cataphoresis. I want to make it quite clear that in my punctures I referred to Apostolic punctures.

Dr. CLEAVES. I see. I never used it. I never had an inflammatory reaction from the punctures with oxydized electrodes.

To be continued